



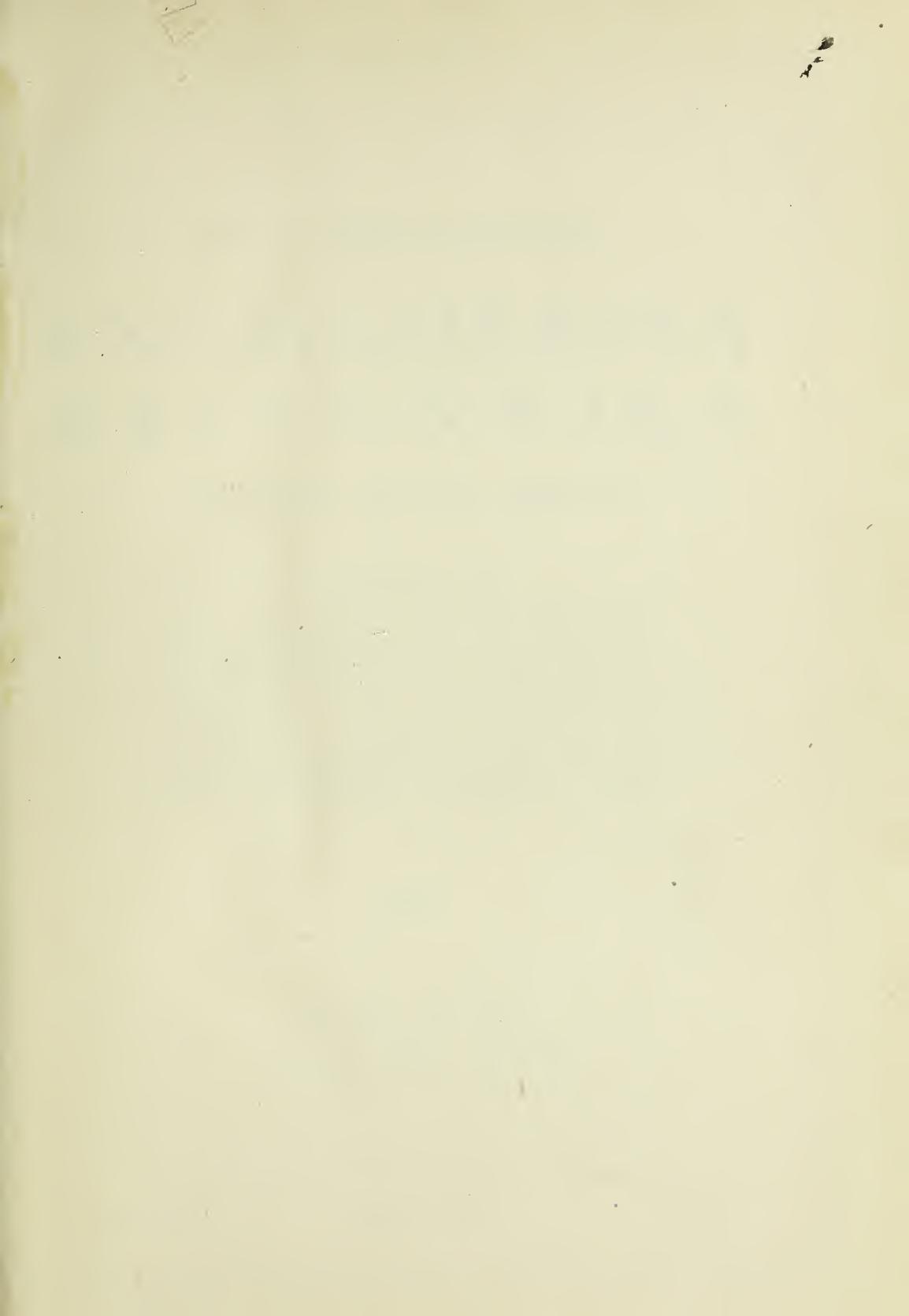



LIBRARY
OF THE
UNIVERSITY
OF ILLINOIS

032
En2b9w
1907
v.7

REMOTE STORAGE

Lib. to Oak.





Digitized by the Internet Archive
in 2017 with funding from
University of Illinois Urbana-Champaign Alternates

<https://archive.org/details/newamericanizede07ency>

Infinite riches in a little room

—CHRISTOPHER MARLOWE

New Americanized

ENCYCLOPÆDIA BRITANNICA

(Twentieth Century Edition)

A DICTIONARY OF

ARTS, SCIENCES, AND LITERATURE
with Many Articles by Special Writers

FULLY ILLUSTRATED

and Revised throughout to Date, with over
ONE HUNDRED COLORED MAPS



IN TEN VOLUMES

VOL. VII—LIBER—OBSIDIAN

THE SAALFIELD PUBLISHING COMPANY

NEW YORK

AKRON, OHIO

CHICAGO

Copyright, 1890, by BELFORD-CLARKE Co.
Copyright, 1896, by THE WERNER COMPANY
Copyright, 1904, by THE SAALFIELD PUBLISHING COMPANY
Copyright, 1905, by THE SAALFIELD PUBLISHING COMPANY
Copyright, 1906, by THE SAALFIELD PUBLISHING COMPANY
Copyright, 1907, by THE SAALFIELD PUBLISHING COMPANY

A. E. B.

032
En269w
1907
v.7

REMOTE STORAGE

LIST OF MAPS

VOLUME VII.

	PAGE
LOUISIANA	3971
MAINE	4048
MARYLAND	4118
MASSACHUSETTS	4121
MEXICO	4194
MICHIGAN	4204
MINNESOTA	4242
MISSISSIPPI	4255
MISSOURI	4258
MONTANA	4304
NEBRASKA	4410
NEVADA	4427
NEW HAMPSHIRE	4438
NEW JERSEY	4443
NEW MEXICO	4446
NEW YORK	4462
NORTH CAROLINA	4501
NUBIA, LOWER	4517

BIOGRAPHIES.

In Volume X. will be found biographical sketches of the following persons not treated of in this volume, and not to be found in the English edition:

Lick, James.
Liddon, Henry Parry, D.D.
Lieber, Guido Norman.
Lincoln, Benjamin.
Lincoln, Robert Todd.
Lind, Jenny (See Goldschmidt.)
Linton, Eliza Lynn.
Linton, William James.
Liszt, Francis.
Little, William John Knox, M.A.
Little Crow.
Littledale, Richard Frederick, LL.D.
Littlejohn, Abram Newkirk, D.D.
Liveing, George Downing, F.R.S.
Livingston, Philip.
Livingston, William.
Locke, David Ross.
Lockwood, James Booth.
Lockyer, Joseph Norman, F.R.S.
Lodge, Henry Cabot.
Loewe, Louis, M.D.
Loftie, William John, F.S.A.
Loftus, Augustus (Lord).
Logan, Benjamin.
Logan, James.
Logan, John.
Logan, John Alexander, Gen.
Logan, Sir William.
Londonderry, Marquis of.
Long, Charles Chaillé.
Long, Crawford W., M.D.
Long, Stephen H.
Longfellow, Henry Wadsworth.
Longstreet, Augustus Baldwin, Prof.
Longstreet, James, Gen.

Loomis, Elias, LL.D.
Lopes, Sir Henry.
Lorain, Lorenzo.
Lorimer, James, M.A., LL.D.
Loring, William Wing, Pasha.
Lorne, Marquis of.
Losada, Manuel.
Lossing, Benson John, LL.D.
Loudoun, Earl of.
Louis I., King of Portugal.
Louis IV., Grand Duke.
Lovejoy, Elijah Parish.
Lovejoy, Owen.
Lovell, John.
Lovell, Mansfield, Gen.
Low, Edward.
Lowe, Edward Clarke, D.D.
Lowe, Edward Joseph, F.R.S.
Lowe, Sir Drury.
Lowell, James Russell, LL.D., D.C.L.
Lowther, James, M.P.
Loyson, Charles (Father Hyacinthe).
Luard, Henry Richards, D.D.
Lubbock, Sir John, M.P., F.R.S.
Luca, Cardinal.
Lucas, Seymour, A.R.A.
Lucan, Earl of.
Lucy, Henry W.
Lucca, Pauline.
Ludlam, Reuben, M.D.
Ludlow, Fitz-Hugh.
Lugard, Sir Edward.
Luitpold, Prince.
Lumsden, Sir Peter.
Lunt, George.

Lussan, Raveneau de.
 Lyall, Sir Alfred.
 Lyman, Phineas.
 Lyon, Mary.
 Lyon, Nathaniel, Gen.
 Lyons, Viscount.
 Lyman, Theodore.
 Lyne, Rev. Joseph (Father Ignatius).
 Lytton, Earl of.
 Mabery, Charles Frederic.
 Macadam, John Loudoun.
 McAlester, Miles Daniel, Gen.
 Macalister, Alexander, F.R.S.
 MacAlister, James.
 McAllister, Matthew Hall.
 McAlpine, William Jarvis.
 Macaulay, James.
 Macbeth, Robert William, A.R.A.
 MacCabe, Edward, Cardinal.
 McCall, Edward R., Capt.
 McCall, George Archibald, Gen.
 McCallum, Daniel Craig, Gen.
 McCallum, Lachlan, Hon.
 McCann, William Penn, Comm.
 McCarthy, Justin, M.P.
 McCaul, John, M.A., LL.D.
 McCauley, Charles Adam H., Capt.
 McCauley, Edward Yorke, Adm.
 McClellan, George Brinton, Gen.
 McClernand, John Alexander, Gen.
 McClintock, John, D.D., LL.D.
 McClintock, Sir Leopold.
 McCloskey, John, Cardinal.
 McCloskey, William George, Bishop.
 McClure, Alexander K.
 McCook, Alexander McD., Gen.
 McCook, Anson George, Gen.
 McCook, Daniel.
 McCook, Edward Moody, Gen.
 McCook, Henry Christopher, D.D.
 McCord, George Herbert.
 McCord, John Samuel.
 MacCormac, Sir William.
 McCormick, Robert, F.R.S.
 McCosh, James, LL.D.
 McCoskry, Samuel Allen, Bishop.
 McCrary, George W.
 McCulloch, Benjamin.
 McCulloch, Hugh.
 McCullough, John Edward.
 Macdonald, Andrew A.
 Macdonald, George.
 MacDonald, Hugh.
 MacDonald, James, Hon.
 MacDonald, James, W. A.
 Macdonald, John S., Hon.
 MacDonald, John Hay Athole.
 Macdonald, Sir John, K.C.B.

McDonogh, John.
 Macdonough, Thomas, Comm.
 McDougall, William, Hon.
 McDowell, Irvin, Gen.
 McDuffie, George.
 Macedo, Joaquim Manoel.
 McEntee, Jervis.
 Macfarren, Sir George.
 MacGahan, J. A.
 McGee, Thomas D'Arcy, M.P.
 McGee, W. J.
 McGlynn, Edward, Rev.
 Macgregor, John.
 McGuire, Hunter Holmes, LL.D.
 McIntosh, Lachlan, Gen.
 McIntyre, Alexander Fraser, Hon.
 Mackarness, John Fielder, Bishop.
 Mackay, Charles, LL.D.
 Mackay, Robert, Hon.
 McKean, Thomas.
 Mackenzie, Alexander, M.P.
 Mackenzie, Alexander Campbell.
 Mackenzie, Alexander Slidell.
 Mackenzie, George Henry.
 Mackenzie, Randall S., Gen.
 Mackenzie, Robert Shelton, LL.D., D.C.L.
 Mackenzie, Sir Morell.
 Mackenzie, William Lyon, Hon.
 McIlvaine, Charles Pettit, Bishop.
 McKinley, William.
 Mackintosh, Charles Herbert, Hon.
 McLane, Louis.
 McLane, Robert M.
 McLaren, William Edward, Bishop.
 McLaws, Lafayette, Gen.
 McLelan, Archibald W., Hon.
 MacMahon, Marshal.
 McMaster, John Bach.
 McMullen, John, Bishop.
 MacNab, Sir Allen.
 Macomb, Alexander, Gen.
 Macon, Nathaniel.
 McPherson, Edward, LL.D.
 McPherson, James Birdseye, Gen.
 Macpherson, Sir David.
 McQuaid, Bernard John, Bishop.
 McVeagh, Wayne.
 MacWhirter, John, A.R.A.
 Maffitt, John Newland, D.D.
 Maffitt, John Newland, Capt.
 Magee, William Connor, Bishop.
 Magoffin, Be'iah.
 Magruder, John B., Gen.
 Mahdi, El.
 Mahone, William.
 Mahony, Francis.
 Maine, Sir Henry.
 Maitland, Sir Frederick.

- Maitland, Sir Peregrine.
 Major, Richard Henry, **F.S.A.**
 Malbone, Edward Greene.
 Malet, Sir Edward.
 Mallery, Garrick.
 Mallet, John William, **F.R.S.**
 Mallock, William Hurrell.
 Mallory, Stephen Russell.
 Malmesbury, Earl of.
 Manco Capac.
 Mann, Ambrose Dudley.
 Manners, Lord John.
 Manning, Daniel.
 Manning, Henry Edward, **Cardinal.**
 Manning, Thomas C.
 Manogue, Patrick, Bishop.
 Manteuffel, Baron von.
 Mapes, James.
 Marbois, François de Barbe.
 March, Francis Andrew, **LL.D.**
 Marcy, Oliver, **LL.D.**
 Marcy, Randolph Barnes, **Gen.**
 Marcy, William Learned.
 Maria Christina, Queen.
 Mario, Guiseppe.
 Mariscal, Ignacio.
 Markham, Clements Robert, **F.R.S.**
 Marks, Henry Stacey, **R.A.**
 Marmaduke, John S., **Gen.**
 Marmora, Alfonso Ferrero Della.
 Marochetti, Charles, Baron.
 Marriott, William Thackeray, **M.P.**
 Marryat, Florence (Mrs. Francis **Lean**).
 Marsh, George Perkins.
 Marsh, Othniel Charles.
 Marshall, family of.
 Marshall, Herbert Menzies.
 Marshall, Humphrey, **Gen.**
 Marshall, James Wilson.
 Marston, Philip Bourke.
 Marston, Westland, **LL.D.**
 Martin, Benjamin Nicholas.
 Martin, Bon Louis Henri.
 Martin, Francis Xavier.
 Martin, Henry Newell, **F.R.S.**
 Martin, Homer Dodge.
 Martin, Josiah.
 Martin, Lady (Helen Faucit).
 Martin, Luther.
 Martin, Thomas Mower.
 Martin, Sir Theodore.
 Martindale, John Henry, **General.**
 Martineau, James, **LL.D.**
 Martinez-Campos, Arsenio, **Gen.**
 Marx, Karl.
 Maskell, William, **M.A.**
 Mason, Charles.
 Mason, George.
 Mason, James Murray.
 Mason, John Young.
 Mason, Lowell.
 Mason, William E.
 Maspero, Gaston.
 Massasoit.
 Massé, Victor.
 Massenet, Jules Emile **Frédéric.**
 Massey, Gerald.
 Masson, David.
 Masters, Maxwell Tylden, **F.R.S.**
 Mather, Increase, **D.D.**
 Mather, Richard Henry, **D.D.**
 Mathers, Helen Buckingham (**Mrs. Reeves**).
 Mathews, Charles James.
 Mathews, William.
 Mathilde, Princess.
 Matthews, Brander.
 Matthews, Henry, **M.P.**
 Matthews, Stanley.
 Maudsley, Henry, **M.D.**
 Max-Müller Frederick.
 May, Edward Harrison.
 May, George Augustus Chichester, **Judge.**
 Mayall, Thomas Jefferson.
 Mayer, Alfred Marshall, **Prof.**
 Mayer, Constant.
 Mayhew, Henry.
 Maynard, Horace.
 Mead, Larkin G.
 Meade, George Gordon, **Gen.**
 Meagher, Thomas Francis.
 Mecklenburg-Strelitz, Grand **Duke of.**
 Medill, Joseph.
 Meding, Oskar.
 Medley, John, Bishop.
 Meeker, Joseph R.
 Meigs, James A., **Prof.**
 Meigs, Montgomery C., **Gen.**
 Meilhac, Henri.
 Meissonier, Jean Louis Ernest.
 Melikoff, Loris, **Gen.**
 Mellon, Mrs. Alfred.
 Mellor, Sir John.
 Melville, George Wallace, **Comm.**
 Melville, Herman.
 Memminger, Charles Gustavus.
 Menabrea, Marquis of.
 Menard, Pierre.
 Menard, René.
 Mendenhall, Thomas C.
 Mendés, Catulle.
 Menken, Adah Isaacs.
 Menzel, Adolf Friedrich Erdmann.
 Mercer, Hugh, **Gen.**
 Merchant, Charles Spencer, **Gen.**
 Mercie, Marcus Jean Antoine.
 Mercier, Honoré.

- Mercur, Ulysses.**
Meredith, George.
 Meredith, Sir William.
 Meredith, Solomon, Gen.
 Meredith, Sullivan Amory, **Gen.**
 Meredith, William Morris.
 Merivale, Charles, D.D.
 Merivale, Herman Charles.
 Meriwether, Lee.
 Mermillod, Gaspard, Bishop.
 Merrill, Lewis, Gen.
 Merrill, Stephen Mason, Bishop.
 Merrill, William Emery, Gen.
 Merry, William Walter, M.A.
 Metternich, Prince.
 Meyer, Johann Georg.
 Meyrick, Frederick, **M.A.**
 Miantonomo.
 Michael, Grand Duke.
 Michelet, Karl Ludwig.
 Michelson, Albert A.
 Midhat Pasha.
 Middleton, Arthur.
 Mifflin, Thomas.
 Milan, ex-King of Servia.
 Milburn, William Henry, Rev.
 Miles, Nelson Appleton, Gen.
 Millais, Sir John.
 Miller, Charles Henry.
 Miller, Joaquin.
 Miller, Samuel Freeman, **Justice.**
 Miller, William.
 Mills, Clark.
 Mills, Luther Lafin.
 Mills, Robert.
 Mills, Roger Q.
 Mills, Sebastian Bach.
 Milne, Sir Alexander.
 Milne-Edwards, Henry.
 Minto, William, M.A.
 Minuit, Peter.
 Miolan-Carvalho, Madame.
 Mitchel, John.
 Mitchel, Ormsby McKnight, **Gen.**
 Mitchell, Donald Grant.
 Mitchell, Maria.
 Mitchell, Peter.
 Mitchell, Samuel Latham.
 Mivart, St. George, F.R.S.
 Modjeska, Helena, Countess.
 Moe, Jorgen E., Bishop.
 Mohr, Karl Frederick, Prof.
 Molesworth, William N.
 Moleschott, Jacob.
 Moltke, Count von.
 Mommsen, Theodor.
 Monck (Viscount).
 Moncreiff, Lord.
 Monier-Williams, Sir Monier.
 Monroe, James.
 Montagu, Lord Robert.
 Montcalm, Louis Joseph, Marquis **de.**
 Montefiore, Sir Moses.
 Montegut, Emile.
 Montepin, Xavier Aymon de.
 Montez, Lola.
 Montezuma I.
 Montezuma II.
 Montgomery, Richard, **Gen.**
 Montgomery, Sir Robert.
 Monti, Luigi.
 Montpensier, Duc de.
 Montt, Manuel.
 Montufar, Lorenzo.
 Moody, Dwight Lyman.
 Moody, Granville.
 Moore, Daniel, M.A.
 Moore, Edward Mott, M.D.
 Moore, George Henry, **LL.D.**
 Moore, Harry Humphrey.
 Moore, John, M.D.
 Moore, Thomas, **F.L.S.**
 Moorhouse, James, Bishop.
 Mora, Francis, Bishop.
 Morales, Juan Bautista.
 Moran, Edward.
 Moran, Patrick Francis, **Bishop.**
 Moran, Thomas.
 Moreno, Francisco.
 Morgan, Charles Hale, Gen.
 Morgan, Daniel, Gen.
 Morgan, Edwin Dennison.
 Morgan, George Osborne.
 Morgan, George Washington, **Gen.**
 Morgan, Henry James.
 Morgan, James Appleton.
 Morgan, John Hunt, Gen.
 Morgan, John Tyler, Gen.
 Morgan, Lewis Henry, **LL.D.**
 Morgan, Matthew S.
 Morgan, Michael Ryan, **Gen.**
 Morgan, Philip Hicky.
 Morier, Sir Robert.
 Morison, James Cotter.
 Morley, Arnold, **M.P.**
 Morley, Earl of.
 Morley, Edward William, **Prof.**
 Morley, Henry, **LL.D.**
 Morley, John, **M.P., LL.D.**
 Morphy, Paul Charles.
 Morrill, Justin S.
 Morrill, Lot Myrick.
 Morris, Clara.
 Morris, Charles, Capt.
 Morris, Charles D'Urban, **Prof.**
 Morris, Francis Orpen. Rev.

- Morris, George Perkins.
 Morris, Gouverneur.
 Morris, John, D.D.
 Morris, Lewis, M.A.
 Morris, Mary Philipse.
 Morris, Philip Richard, A.R.A.
 Morris, Robert.
 Morris, Sir Michael.
 Morris, William.
 Morrison, William R.
 Morse, David Appleton, M.D.
 Morse, Edward Sylvester, Prof.
 Morse, John Torrey.
 Morse, Henry Dutton.
 Morton, Henry.
 Morton, John.
 Morton, Levi Parsons.
 Morton, Oliver Perry.
 Morton, Thomas C.
 Morton, William T.G.
 Mosby, John Singleton, Gen.
 Moseley, Henry Nottidge, LL.D., F.R.S.
 Moss, Lemuel, D.D., LL.D.
 Mott, Lucretia.
 Moulton, Louise Chandler.
 Moultrie, William, Gen.
 Mowat, Oliver, M.P.
 Mowatt, Anna Cora.
 Mowbray, Sir John.
 Müller Sir Ferdinand von, F.R.S.
 Mühlenberg, William Augustus, D.D.
 Mühlenberg, John Peter Gabriel, Gen.
 Muir, Sir William.
 Mukhtar Pacha.
 Mulhall, Michael G.
 Mulligan, James A.
 Munk, Hans.
 Munk, William, M.D.
 Munkácsy, Mihaly.
 Munroe, Charles Edward, Prof.
 Murdoch, James Edward.
 Mure, David.
 Murray, Alexander.
 Murray, Alexander S.
 Murray, Logan Crittenden.
 Murray, William Henry Harrison.
 Murray, Lindley.
 Musurus Pacha.
 Myer, Albert James, Gen.
 Mylne, Rev. Louis George.
 Naar, David.
 Nachtigal, Gustav.
 Naglee, Henry Morris, Gen.
 Napier and Ettrick, Lord.
 Napier of Magdala, Lord.
 Napoleon, Prince (Jerome).
 Napper, Tandy.
 Narbonne, Peter Remi.
 Nares, Sir George.
 Nasmyth, James.
 Nason, Elias.
 Nason, Henry Bradford, LL.D.
 Nasr-Ed-Deen (Shah of Persia).
 Nassau, Duke of.
 Nast, Thomas.
 Neal, David D.
 Neal, John.
 Neely, Henry Adams, Bishop.
 Neill, Thomas Hewson, Gen.
 Neilson, Lillian Adelaide.
 Nelaton, Auguste.
 Nelson, Thomas.
 Nelson, William, Gen.
 Nemours, Duc de.
 Nettlehip, Henry, Prof.
 Neville, Henry.
 Nevin, John Williamson, D.D.
 Nevin, Robert J., D.D.
 New, John Chalfant.
 Newberry, John Strong, LL.D.
 Newberry, Walter Loomis.
 Newcomb, Simon, LL.D.
 Newell, Robert Henry.
 Newman, Francis William, Prof.
 Newman, Henry R.
 Newman, John Henry, Cardinal.
 Newnan, John Philip, Bishop.
 Newport, Christopher.
 Newton, Hubert Anson, LL.D.
 Newton, Alfred, F.R.S.
 Newton, Charles Thomas, D.C.L.
 Newton, Gilbert Stuart.
 Newton, Isaac.
 Newton, John, Gen.
 Newton, Robert Safford, M.D.
 Nichol, John, LL.D.
 Nicholas, Grand Duke.
 Nicholls, Henry Alfred Alford, M.D.
 Nichols, William Ripley.
 Nicholson, Henry Alleyne, F.G.S.
 Nicholson, James W. A., Adm.
 Nicholson, Sir Charles, D.C.L., LL.D.
 Nicholson, Sir Francis.
 Nicolls, Sir Richard.
 Nicol, Erskine, A.R.A.
 Nicolay, John George.
 Nicoll, James Craig.
 Niemeyer, John Henry, Prof.
 Nightingale, Florence.
 Nigra, Count Constantino.
 Niles, John Milton.
 Nilsson, Christine.
 Ninegret.
 Nisard, Jean Marie Napoléon Désiré.
 Noah, Mordecai Manuel.
 Noire, Ludwig.

Nordenskiöld, Baron.
Nordhoff, Charles.
Norfolk, Duke of.
Normanby, Marquis of.
Norman-Neruda, Wilhelmine.
Norquay, John, Hon.
North, Sir Ford.
Northbrook, Earl of.
Northrop, Lucius B.
Northumberland, Duke of.
Norton, Charles Ledyard.
Norton, Lord.
Norton, John Pitkin, Prof.
Norton, Lewis Mills, Prof.
Norton, Sidney Augustus, **LL.D.**
Nott, Eliphalet, D.D.

Novello, Clara Anastasia.
Novello, Joseph Alfred.
Noyes, Edward F.
Noyes, John Humphrey.
Nuñez, Casto Mendez.
Nuñez de Arce, Gasper.
Nuñez, Rafael.
Oakeley, Sir Herbert.
Oakes, James, Gen.
Oakes, John Wright, A.R.A.
Oakley, John, D.D.
O'Brien, Cornelius, Archbishop.
O'Brien, Fitz-James.
O'Brien, Lucius Richard.
O'Brien, William, M.P.

AMERICANIZED

ENCYCLOPÆDIA BRITANNICA.

VOLUME VII.

LIB

LIBER AND LIBERA, among the Romans, were a pair of deities, male and female, in whose worship two very different phases exist side by side. In the country feast of the vintage, and the city festival of March 17th called *Liberalia*, we find purely Italian ceremonial unaffected by Greek religion. The country festival was a great merry-making, where the first-fruits of the new must were offered to the gods. It was full of unbridled rejoicing, and characterized by the grossest symbolism, in honor of the fertility of nature. It is usual to refer the name Liber to the free, unrestrained character of his worship. In the city festival, growing civilization had impressed a new character on the primitive religion, and connected it with the framework of society. At this time the youths laid aside the boy's *toga pretexta* and assumed the man's *toga libera* or *virilis*. Cakes of *far*, honey, and oil (*liba*) were offered to the two gods at this festival. Liber is often invoked as *Liber Pater*, and we find even the expression *Jupiter Liber*, taking us back to the primitive stage of religion when no divine hierarchy of gods had been elaborated, and when Liber and Libera were in the sphere of their cultus the sole god and goddess. Originally Liber is probably only an epithet of Jupiter.

At an early period the Hellenic religion of Demeter, common to all the Greek colonies of Italy and Sicily, spread to Rome; then Liber and Libera were identified with Dionysus and Persephone, and associated with another Italian goddess Ceres, who was identified with Demeter.

LIBERIA, a negro republic on the Grain Coast of West Africa. Founded in 1822 by American philanthropists for the settlement of freedmen who wished to return to their native land, or to enjoy political and social privileges then denied them in the United States, it remained for twenty-five years under the tutelage of the United States, but on July 26, 1847, it was declared independent. In 1848 it was recognized as a sovereign state by Great Britain, which aided it in various ways, and by other continental powers, and finally, in 1861, by the United States. Its nominal boundaries are from the river Jong, a tributary of the Sherbar, and the river San Pedro, a distance of 380 miles, the limits

of the state in the interior being usually stated at from 80 to 100 miles eastward, though this is unsettled, and the entire area of the country at 35,000 square miles, or 1,000 miles less than Holland and Belgium combined. Like that of northern Guinea generally, the Liberian shore is low, but the country rises toward the interior, and is well wooded and watered by numerous streams. The climate is, however, hot and unhealthy for Europeans, though of late years it has been improved by drainage, and is considered superior to that of any part of the neighboring coast. The soil is fertile, and well suited for the growth of tropical crops, such as cotton, rice, sugar, indigo, yams, groundnuts, bananas, ginger, cassava, pineapples, cocoanuts, limes, oranges, tamarinds, and the Liberian variety of coffee held in such high esteem. These products, in addition to palm oil, form the main support of the inhabitants, who, in return, import arms, ammunition, tobacco, salt provisions, implements of husbandry, cutlery, British cottons, and other manufactured goods. Coffee, palm oil, palm kernels, rubber, ivory, dyewoods, hides, arrowroot, sugar, cocoa, ginger, and rice form the principal articles of its commerce, which is carried on chiefly with Great Britain, Holland, Hamburg and America. Copper, gold, iron and deposits of gum copal exist, but they are not worked, and all the large wild animals have long since been killed or driven out of the woods. Stock can be kept in the higher lands. The government is modeled on that of the United States, and consists of a president, and a congress composed of a senate of eight members elected for four years, and of a house of representatives of thirteen members elected for three years, in addition to a supreme court, and a cabinet of the American type. One additional representative is given for each additional 10,000 inhabitants, by which the population may increase. Military service in the militia is obligatory on every male citizen between the ages of sixteen and fifty, but there is no standing army. There is no established church, and all faiths are equally tolerated. The state is divided into four counties (Mezurada, Grand Bassa, Sinoe, and Maryland), and these again into townships, each sixty-four square miles in area. There are a number of little villages, but the only place

of any consequence is Monrovia, the capital, containing 5,000 inhabitants, and in appearance very like a town in the southern United States, but in no way remarkable except for the large number of churches within its bounds. Beside Monrovia, the chief ports are Robertsport, Marshall, Edina or Buchanan, Greenville, Sesters River, Sasstown, and Harper, and in 1881 foreigners were further permitted to trade at any point to the north of Robertsport. The present population of the republic comprises 18,000 civilized negroes, chiefly of American origin, and 2,050,000 half-wild natives, some of whom are adopting a settled life, and conforming to the habits of their tamed countrymen. Among the more interesting tribes are the Veis, the Bassas, the Krus and the Mandingoes. The American Methodist Episcopal mission dates from 1833, the American Episcopal from 1834, and that of the American Baptists from 1835.

LIBERIUS, pope from 352 to 366, the successor of Julius I., was consecrated, according to the *Catalogus Liberianus*, on May 22d. In 355 Liberius was one of the few who, along with Eusebius of Vercelli, Dionysius of Milan, and Lucifer of Cagliari, refused to sign the condemnation of Athanasius; the consequence was his relegation to Bercea in Thrace, Felix II. (antipope) at the same time being consecrated his successor by three "catascopi haud episcopi," as Athanasius called them. At the end of an exile of more than two years he yielded to far as to subscribe the third Sirmian formula giving up the "homoousion"—an act which procured his immediate and triumphant return to Rome, but has ever since caused considerable embarrassment to maintainers of the indefectibility of Roman orthodoxy. The remainder of his pontificate was uneventful. He died on September 24, 366, and was succeeded by Damasus I.

LIBOURNE, the chief town of an arrondissement and in point of population the second town of the department of Gironde, France, is situated at the confluence of the Isle with the Dordogne, 337 miles by rail southwest from Paris, and twenty-two miles east from Bordeaux. The sea is fifty-six miles off, but the tide affects the river so as to admit of vessels of 300 tons burden reaching the town. The principal articles of commerce are the wines and brandies of the district, the growths of chief repute being those of St. Émilion, a short distance above Libourne, on the right bank of the Dordogne, and of Canon, a little below Fronsac. The population is 15,231.

LIBRARIES, in our modern sense of collections of printed or written literature, imply an advanced and elaborate civilization. If the term be extended to any considerable collection of written documents, they must be nearly as old as civilization itself. The earliest use to which the invention of inscribed or written signs was put was probably to record important religious and political transactions. These records would naturally be preserved in sacred places, and accordingly the earliest libraries of the world were probably temples, and the earliest librarians priests. And indeed before the extension of the arts of writing and reading the priests were the only persons who could perform such work as, e.g., the compilation of the *Annales Maximii*, which was the duty of the pontifices in ancient Rome. The beginnings of literature proper in the shape of ballads and songs may have continued to be conveyed orally only from one generation to another, long after the record of important religious or civil events was regularly committed to writing. The earliest collections of which we know anything, therefore, were collections of archives. Of this character appear to have been such famous collections as that of the Medians at Ecbatana or the Persians at Susa. It is not until the development of arts and sciences, and the growth of a considerable written liter-

ature, and even of a distinct literary class, that we find collections of books which can be called libraries in our modern sense. It is of libraries in the modern sense, and not, except incidentally, of archives, that we are to speak.

The researches which have followed the discoveries of Botta and Layard have thrown unexpected light not only upon the history but upon the arts, the sciences, and the literatures of the ancient civilizations of Babylonia and Assyria. In all these wondrous revelations no facts are more interesting than those which show the existence of extensive libraries so many ages ago, and none are more eloquent of the elaborateness of these forgotten civilizations.

In the course of his excavations at Nineveh in 1850, Layard came upon some chambers in the southwest palace, the floor of which, as well as of the adjoining rooms, was covered to the depth of a foot with tablets of clay, covered with cuneiform characters, in many cases so small as to require a magnifying glass. These varied in size from an inch to a foot square. A great number of them were broken, as Layard supposed by the falling in of the roof, but as the late Mr. George Smith thought by having fallen from the upper story, upon which he believed the collection to have been placed. These tablets formed the library of the great monarch Assurbanipal—the Sardanapalus of the Greeks—the greatest patron of literature among the Assyrians. It is estimated that this library consisted of some ten thousand distinct works and documents, some of the works extending over several tablets. The tablets appear to have been methodically arranged and catalogued, and the library seems to have been thrown open for the general use of the king's subjects. A great portion of this library has already been brought to England and deposited in the British Museum, but it is calculated that there still remain some 20,000 fragments to be gathered up. For further detail as to Assyrian libraries, and the still earlier Babylonian libraries from which the Assyrians drew their science and literature, see **BABYLONIA**.

Of the libraries of ancient Egypt our knowledge is much less full and precise. It seems to be ascertained that the oldest hieroglyphic writings now extant run some centuries farther back than 2,000 B.C. We possess a papyrus manuscript which is assigned to the age of Amenophis I. of the eighteenth dynasty, perhaps about 1,600 B.C., and the fabric is so perfect as to point to a much earlier invention. With the invention of papyrus came the age of books. The temples were the centers of literary activity, and to each of them were attached professional scribes who occupied a very respectable position. Their function was regarded as a religious one, for the distinction between religion and science had not yet been made. The sacred books of Thoth—forty-two in number—constituted as it were a complete encyclopædia of religion and science. But they did not forbid speculation, or a wider development of the principles contained in them. So there arose a great mass of literature in the shape of exposition and commentary. To such an extent did this increase that at the time of the Greek conquest of Egypt the Thoth literature is said to have amounted to 36,525 books. Books were collected not only in the temples, but also at the tombs of kings. The most famous of these libraries dates from the fourteenth century B.C., and was the so-called library of King Osymandyas, described by Diodorus Siculus, who relates that it bore an inscription which he renders by the words "the dispensary of the soul." Osymandyas has been identified with the great king Rameses I., and the seat of the library is supposed by Wilkinson to have been the **Ramesseum**, the magnificent palace temple near Thebes.

Of the libraries of ancient Greece we have very little knowledge, and such knowledge as we possess comes to us for the most part from late compilers. Among those who are known to have collected books are Pisistratus, Polycrates of Samos, Euclid the Athenian, Nicocrates of Cyprus, Euripides and Aristotle. At Cnidus there is said to have been a special collection of works upon medicine. Pisistratus is said to have been the first of the Greeks who collected books on a large scale.

Plato is known to have been a collector; and Xenophon tells us of the library of Euthydemus. The library of Aristotle was bequeathed by him to his disciple Theophrastus, and by Theophrastus to Neleus, who carried it to Scepsis, where it is said to have been concealed underground to avoid the literary cupidity of the kings of Pergamus. Its subsequent fate has given rise to much controversy, but, according to Strabo, it was sold to Apellicon of Teos, who carried it to Athens, where, after Apellicon's death, it fell a prey to the conqueror Sulla, and was transported by him to Rome. It is at all events certain that the libraries of Alexandria were the most important as they were the most celebrated of the ancient world. Under the enlightened rule of the Ptolemies a society of scholars and men of science was attracted to their capital. It seems pretty certain that Ptolemy Soter had already begun to collect books, but it was in the reign of Ptolemy Philadelphus that the libraries were properly organized and established in separate buildings. Ptolemy Philadelphus sent into every part of Greece and Asia to secure the most valuable works, and no exertions or expense were spared in enriching the collections. Ptolemy Euergetes, his successor, is said to have caused all books brought into Egypt by foreigners to be seized for the benefit of the library, while the owners had to be content with receiving copies of them in exchange. Nor did the Alexandrian scholars exhibit the usual Hellenic exclusiveness, and many of the treasures of Egyptian and even of Hebrew literature were by their means translated into Greek. There were two libraries at Alexandria; the larger, in the Bruchium quarter, was in connection with the Museum, a sort of academy, while the smaller was placed in the Serapeum. The number of volumes in these libraries was very large, although it is difficult to attain any certainty as to the real numbers among the widely varying accounts. According to a scholium of Tzetzes, who appears to draw his information from the authority of Callimachus and Eratosthenes, who had been librarians at Alexandria, there were 42,800 volumes or rolls in the Serapeum and 490,000 in the Bruchium. This enumeration seems to refer to the librarianship of Callimachus himself under Ptolemy Euergetes. In any case the figures agree tolerably well with those given by Aulus Gellius (700,000) and Seneca (400,000). It should be observed that, as the ancient roll or volume usually contained a much smaller quantity of matter than a modern book—so that, e.g., the history of Herodotus might form nine "books" or volumes, and the *Iliad* of Homer twenty-four—these numbers must be discounted for the purposes of comparison with modern collections. The series of the first five librarians at Alexandria appears to be pretty well established as follows: Zenodotus, Callimachus, Eratosthenes, Apollonius, and Aristophanes; and their activity covers a period of about a century. The first experiments in bibliography appear to have been made in producing catalogues of the Alexandrian libraries. Among other lists, two catalogues were prepared by order of Ptolemy Philadelphus, one of the tragedies, the other of the comedies contained in the collections. When Caesar set fire to the fleet in the harbor of Alexandria, the flames accidentally extended

to the larger library of the Bruchium, and it was destroyed. Antony endeavored to repair the loss by presenting to Cleopatra the library from Pergamus. This was very probably placed in the Bruchium, as this continued to be the literary quarter of Alexandria until the time of Aurelian. Thenceforward the Serapeum became the principal library. The usual statement that from the date of the restoration of the Bruchium under Cleopatra the libraries continued in a flourishing condition until they were destroyed after the conquest of Alexandria by the Saracens in 640 A.D. can hardly be supported.

The magnificence and renown of the libraries of the Ptolemies excited the rivalry of the kings of Pergamus, who vied with the Egyptian rulers in their encouragement of literature. Despite the obstacles presented by the embargo placed by the Ptolemies upon the export of papyrus, the library of the Attali attained considerable importance, and, as we have seen, when it was transported to Egypt numbered 200,000 volumes.

The early Romans were far too warlike and practical a people to devote much attention to literature, and it is not until the last century of the republic that we hear of libraries in Rome. The collections of Carthage, which fell into their hands when Scipio sacked that city (146 B.C.), had no attraction for them; and with the exception of the writings of Mago upon agriculture, which the senate reserved for translation into Latin, they bestowed all the books upon the kinglets of Africa. It is in accordance with the military character of the Romans that the first considerable collections of which we hear in Rome were brought there as the spoils of war. The first of these was that brought by Æmilius Paulus from Macedonia after the conquest of Perseus, (167 B.C.) The library of the conquered monarch was all that he reserved from the prizes of victory for himself and his sons, who were fond of letters. Next came the library of Apellicon the Teian, brought from Athens by Sulla, (86 B.C.) This passed at his death into the hands of his son, but of its later history nothing is known. The rich stores of literature brought home by Lucullus from his eastern conquests (about 67 B.C.) were freely thrown open to his friends and to men of letters. Accordingly his library and the neighboring walks were much resorted to, especially by Greeks. It was now becoming fashionable for rich men to furnish their libraries well, and the fashion prevailed until it became the subject of Seneca's scorn and Lucian's wit. The zeal of Cicero and Atticus in adding to their collections is well known to every reader of the classics. Tyrannion is said to have had 30,000 volumes of his own; and that M. Terentius Varro had large collections we learn from Cicero. The honor of being the first actually to dedicate a library to the public is said by Pliny and Ovid to have fallen to Pollio, who erected a library in the Atrium Libertatis on Mount Aventine, defraying the cost from the spoils of his Illyrian campaign. The library of Pollio was followed by the public libraries established by Augustus. That emperor, who did so much for the embellishment of the city, erected two libraries, the Octavian and the Palatine. The Octavian library perished in the fire which raged at Rome for three days in the reign of Titus. The Palatine was, at all events in great part, destroyed by fire in the reign of Commodus. The successors of Augustus, though they did not equal him in their patronage of learning, maintained the tradition of forming libraries. Tiberius, his immediate successor, established one in his splendid house on the Palatine, to which Gellius refers as the "Tiberian library," and Suetonius relates that he caused the writings and images of his favorite Greek poets to be placed in the

public libraries. Vespasian established a library in the Temple of Peace erected after the burning of the city under Nero. Domitian restored the libraries which had been destroyed in the same conflagration, procuring books from every quarter, and even sending to Alexandria to have copies made. He is also said to have founded the Capitoline library, though others give the credit to Hadrian. The most famous and important of the imperial libraries, however, was that created by Ulpian Trajanus, known as the Ulpian library, which was first established in the Forum of Trajan, but was afterward removed to the baths of Diocletian. In this library were deposited by Trajan the "*libri lintei*" and "*libri elephantini*," upon which the *senatus consulta* and other transactions relating to the emperors were written. The library of Domitian, which had been destroyed by fire in the reign of Commodus, was restored by Gordian, who added to it the books bequeathed to him by Serenus Sammonicus. Altogether in the fourth century there are said to have been twenty-eight public libraries in Rome.

As the number of libraries in Rome increased, the librarian, who was generally a slave or a freedman, became a recognized public functionary. The names of several librarians are preserved to us in inscriptions, including that of C. Hymenæus, who appears to have fulfilled the double function of physician and librarian to Augustus.

When the seat of the empire was removed by Constantine to his new capital upon the Bosphorus, the emperor established a collection there, in which Christian literature was probably admitted for the first time into an imperial library. Diligent search was made after the Christian books which had been doomed to destruction by Diocletian. Even at the death of Constantine, however, the number of books which had been brought together amounted only to 6,900. The smallness of the number, it has been suggested, seems to show that Constantine's library was mainly intended as a repository of Christian literature. However this may be, the collection was greatly enlarged by some of Constantine's successors, especially by Julian and Theodosius, at whose death it is said to have increased to 100,000 volumes. Julian, himself a close student and voluminous writer, though he did his best to discourage learning among the Christians, and to destroy their libraries, not only augmented the library at Constantinople, but founded others, including one at Nisibis, which was soon afterward destroyed by fire. From the Theodosian code we learn that in the time of that emperor a staff of seven copyists was attached to the library at Constantinople under the direction of the librarian. The library was burnt under the emperor Zeno, in 477, but was again restored.

Meanwhile, as Christianity made its way and a distinctively Christian literature grew up, the institution of libraries became part of the organization of the church. When the church of Jerusalem was founded in the third century a library was added to it, and it became the rule to attach to every church a collection of the books necessary for the inculcation of Christian doctrine. The largest of these libraries, that founded by Pamphilus at Cæsarea, and said to have been increased by Eusebius, the historian of the church, to 30,000 volumes, is frequently mentioned by St. Jerome. St. Augustine bequeathed his collection to the library of the church at Hippo, which was fortunate enough to escape destruction at the hands of the Vandals.

The removal of the capital to Byzantium was in itself a serious blow to literature. Henceforward the science and learning of the East and West were divorced. The libraries of Rome ceased to collect the writings of

the Greeks, while the Greek libraries had never cared much to collect Latin literature. The influence of the church became increasingly hostile to the study of pagan letters. The repeated irruptions of the barbarians soon swept the old learning and libraries alike from the soil of Italy. With the close of the Western empire in 476 the ancient history of libraries may be said to cease.

During the first few centuries after the fall of the Western empire, literary activity at Constantinople had fallen to its lowest ebb. In the West, amidst the general neglect of learning and literature, the collecting of books, though not wholly forgotten, was cared for by few.

The charge of books as well as of education fell more and more exclusively into the hands of the church. While the old schools of the rhetoricians died out new monasteries arose everywhere. Knowledge was no longer pursued for its own sake, but became subsidiary to religious and theological teaching. The proscription of the old classical literature, which is symbolized in the fable of the destruction of the Palatine library by Gregory the Great, was only too effectual. The Gregorian tradition of opposition to pagan learning long continued to dominate the literary pursuits of the monastic orders and the labors of the scriptorium.

During the sixth and seventh centuries the learning which had been driven from the Continent took refuge in the British Islands, where it was removed from the political disturbances of the mainland. In the Irish monasteries during this period there appear to have been many books, and the Venerable Bede was superior to any scholar of his age. Theodore of Tarsus brought a considerable number of books to Canterbury from Rome in the seventh century, including several Greek authors. The library of York, which was founded by Archbishop Egbert, was almost more famous than that of Canterbury. The verses are well known in which Alcuin describes the extensive library under his charge, and the long list of authors whom he enumerates is superior to that of any other library possessed by either England or France in the twelfth century, when it was unhappily burnt. The inroads of the Northmen in the ninth and tenth centuries had been fatal to the monastic libraries on both sides of the channel. It was from York that Alcuin came to Charlemagne to superintend the school attached to his palace; and it was doubtless inspired by Alcuin that Charles issued the memorable document which enjoined that in the bishoprics and monasteries within his realm care should be taken that there should be not only a regular manner of life, but also the study of letters. When Alcuin finally retired from the court to the abbacy of Tours, there to carry out his own theory of monastic discipline and instruction, he wrote to Charles for leave to send to York for copies of the books of which they had so much need at Tours. While Alcuin thus increased the library at Tours, Charlemagne enlarged that at Fulda, which had been founded in 774, and which all through the Middle Ages stood in great respect.

The hopes of a revival of secular literature fell with the decline of the schools established by Charles and his successors. The knowledge of letters remained the prerogative of the church, and for the next four or five centuries the collecting and multiplication of books were almost entirely confined to the monasteries. Several of the greater orders made these an express duty; this was especially the case with the Benedictines. It was the first care of St. Benedict, we are told, that in each newly founded monastery there should be a library. Monte Cassino became the starting point of a long line of institutions which were destined to be the centers of religion and of literature. It must indeed be remem-

bered that literature in the sense of St. Benedict meant Biblical and theological works, the lives of the saints and martyrs, and the lives and writings of the fathers. Of the reformed Benedictine orders the Carthusians and the Cistercians were those most devoted to literary pursuits. The abbey of Fleury, of Melk, and of St. Gall were remarkable for the splendor of their libraries. In a later age the labors of the congregation of St. Maur form one of the most striking chapters in the history of learning. The Augustinians and the Dominicans rank next to the Benedictines in their care for literature.

The British Museum ranks in importance before all the great libraries of the world, with the single exception of the Bibliothèque Nationale, at Paris, and far excels the latter institution in the systematic arrangement and accessibility of its contents. Recent changes have somewhat limited its former universality of character, but it still remains the grand national repository of literature and archaeology. The library consists of over 1,550,000 printed volumes and 50,000 manuscripts. This extraordinary opulence is principally due to the enlightened energy of the late Sir Antonio Panizzi. The number of volumes in the printed book department, when he took the keepership, in 1837, was only 240,000; and during the nineteen years he held that office about 400,000 were added, mostly by purchase, under his advice and direction. It was Panizzi, likewise, who first seriously set to work to see that the national library reaped all the benefits bestowed upon it by the Copyright Act.

The foundation of the British Museum dates from 1753, when effect was given to the bequest (in exchange for £20,000 to be paid to his executors) by Sir Hans Sloane, of his books, manuscripts, curiosities, etc., to be held by trustees for the use of the nation. A bill was passed through parliament for the purchase of the Sloane collections and of the Harleian MSS., costing £10,000. To these, with the Cottonian MSS., acquired by the country in 1700, was added by George II., in 1757, the royal library of the former kings of England, coupled with the privilege, which that library had for many years enjoyed, of obtaining a copy of every publication entered at Stationers' Hall. This addition was of the highest importance, as it enriched the museum with the old collections of Archbishop Cranmer, Henry prince of Wales, and other patrons of literature, while the transfer of the privilege with regard to the acquisition of new books, a right which has been maintained by successive Copyright Acts, secured a large and continuous augmentation, the yearly average of which has now reached 8,000 or 9,000 volumes. A lottery having been authorized to defray the expenses of purchases, as well as for providing suitable accommodation, the museum and library were established in Montague House, and opened to the public January 15, 1759. In 1763 George III. presented the well-known Thomason collection (in 2,220 volumes) of books and pamphlets issued in England between 1640 and 1662, embracing all the controversial literature which appeared during that period. The Rev. C. M. Cracherode, one of the trustees, bequeathed his collection of choice books in 1799; and in 1820 Sir Joseph Banks left to the nation his important library of 16,000 volumes. Many other libraries have since then been incorporated in the museum, the most valuable being George III.'s royal collection (15,000 volumes of tracts, and 65,259 volumes of printed books, including many of the utmost rarity, which had cost the king about £130,000), which was presented (for a pecuniary consideration, it has been said) by George IV. in 1823, and that of Thomas Grenville (20,240 volumes of rare books, all in fine condition and binding), which was acquired under bequest in 1846. The Cracherode,

Banksian, King's, and Grenville libraries are still preserved as separate collections. Other libraries of minor note have also been absorbed in a similar way, while, at least since the time of Panizzi, no opportunity has been neglected of making useful purchases at all the British and Continental book auctions.

The collection of English books is far from approaching completeness, but, apart from the enormous number of volumes, the library contains an extraordinary quantity of rarities. Few libraries in the United States equal either in number or value the American books in the museum. The collection of Slavonic literature, due to the initiative of the late Mr. Watts, is a remarkable feature; after that of the St. Petersburg Imperial Library it is believed to be the largest in existence. Indeed, in cosmopolitan interest the museum is without a rival in the world, possessing as it does the best Hungarian collection out of that country, the best Dutch library out of Holland, and in short the best library in any European language out of the territory in which the language is vernacular. The Hebrew books number over 12,000, the Chinese nearly 27,000, and the printed books in other Oriental languages about 13,000 volumes. Periodical literature has not been forgotten, and the series of newspapers is of great extent and interest. Great pains are taken by the authorities to obtain the copies of the newspapers published in the United Kingdom to which they are entitled by the provisions of the Copyright Act, and upward of 1,900 are annually collected, filed, and bound. Under the English Copyright Act there were received, in 1881, not counting single pieces, such as broadsides, songs, etc., 8,857 volumes and pamphlets, and 21,792 parts of volumes, and through the international copyright treaties 941 volumes and 433 parts.

The department of MSS. is at least equal in importance to that of the printed books. The collection of MSS. in the European languages ranges from the second century before Christ down to our own times, and includes the ALEXANDRIAN MS. (*q.v.*). The old historical chronicles of England, the charters of the Anglo-Saxon kings, and the celebrated series of Arthurian romances are well represented; and care has been taken to acquire on every available opportunity the unprinted works of English writers. The famous collections of MSS. made by Sir Robert Cotton and Harley, earl of Oxford, have already been mentioned, and from these and other sources, the museum has become rich in early Anglo-Saxon and Latin codices, some of them exhibiting marvels of skill in calligraphy and ornamentation, such as the charters of King Edgar and Henry I. to Hyde Abbey, which are written in gold letters, others interesting for different reasons, such as the book of Durham, in Latin and Anglo-Saxon, reputed to have been Bede's own copy. The Burney collection of classical MSS. furnished important additions, so that from this source and from the collection of Arundel MSS. (transferred from the Royal Society in 1831), the museum can boast of an early copy of the *Iliad*, and one of the earliest known codices of the *Odyssey*. There is likewise an extensive series of ancient Irish texts, with many modern transcripts, the Bridgewater MSS. on French history, and Lord Guilford's similar collection to illustrate the history of Italy. Special reference may be made to the celebrated Bedford Missal, illuminated for the duke of Bedford, regent of France, and to Henry VI.'s copy of Hardyng's Chronicle. The Oriental collection is also extremely rich and ample, including the library formed by Mr. Rich (consul at Bagdad in the early part of this century), and a vast quantity of Arabic, Persian and Turkish MSS.; the Chambers collection of Sanskrit MSS.; several other collections of Indian

MSS.; and a copious library of Hebrew MSS. (including that of the great scholar Michaelis, and codices of great age, recently brought from Yemen). The collection of Syriac MSS., embracing the relics of the famous library of the convent of St. Mary Deipara in the Nitrian desert, formed by the abbot Moses of Nisibis, in the tenth century, is the most important in existence; of the large store of Abyssinian volumes many were amassed after the campaign against King Theodore. The number of genealogical rolls and documents relating to the local and family history of Great Britain is very large. Altogether there are now over 50,000 MSS. (of which 8,500 are Oriental), besides 45,000 charters and rolls.

The musical works comprise upward of 11,000 volumes of vocal and nearly 6,000 volumes of instrumental music, the number of separate pieces amounting to more than 70,000. The catalogue is in manuscript. The collection of maps, charts, plans, and topographical drawings is also a remarkable one. The maps are nearly 116,000 in number.

London is very badly off as regards public libraries, and the largest general collection which is available without any tedious preliminary forms is that of the corporation of the city of London at the Guildhall. The library of the Patent Office is the largest scientific and technical collection, indeed the only one which is readily open to the public. There are at present 80,000 volumes, including a very extensive series of the transactions and journals of learned bodies. Medical and surgical libraries are attached to all chief hospitals and medical societies.

For the fine arts there is the National Art Library (1852) at the South Kensington Museum, which is now an excellent collection of 56,000 volumes, 56,000 photographs, 25,000 drawings, and 80,000 prints.

The best library of archaeology and kindred subjects is that of the Society of Antiquaries, consisting of nearly 20,000 printed volumes and 500 MSS. Among subscription libraries, the London Library stands first in order of importance.

The library of the Royal Geographical Society (1832), is a valuable collection of 20,000 volumes of voyages and travels, and works on the sciences connected with geography, with many costly government publications and geographical serials. The catalogue has been printed with supplements down to 1880. The maps and charts number 35,000, with 500 atlases and 240 large diagrams.

The principal library in Scotland is that of the Faculty of Advocates, who in 1680 appointed a committee of their number, which reported that "it was fitt that, seeing if the recusants could be made pay their entire money, there would be betwixt three thousand and four thousand pounds in cash; that the same be employed on the best and fynest lawers and other law bookes, conforme to a catalogue to be condescended upon by the Facultie, that the samen may be a fonde for ane Bibliothecque whereto many lawers and others may leave their books." In 1682 the active carrying out of the scheme was committed to the Dean of Faculty, Sir George Mackenzie of Rosehaugh, who may be regarded as the founder of the library. In 1684 the first librarian was appointed, and the library appears to have made rapid progress, since it appears from the treasurer's accounts that in 1686 the books and furniture were valued at upward of £11,000 Scots, exclusive of donations. In the year 1700, the rooms in the Exchange Stairs, Parliament Close, in which the library was kept, being nearly destroyed by fire, the collection was removed to the ground floor of Parliament House, where it has ever since remained. The library retains the copyright privilege conferred upon it in 1709. The number of volumes

in the library is computed to amount to 265,000; of the special collections the most important are the Astorga collection of old Spanish books, purchased by the faculty in 1824 for £4,000; the Thorkelin collection, consisting of about 1,200 volumes relating chiefly to the history and antiquities of the northern nations, and including some rare books on old Scottish poetry; the Dietrich collection of over 100,000 German pamphlets and dissertations, including many of the writings of Luther and Melancthon, purchased for the small sum of £80; and the Combe collection.

The establishment of the library of Trinity College, Dublin, is contemporaneous with that of the Bodleian, Oxford, and it is an interesting circumstance that, when Challoner and Ussher (afterward the archbishop) were in London purchasing books to form the library, they met Bodley there, and entered into friendly intercourse and coöperation with him to procure the choicest and best books. The commission was given to Ussher and Challoner as trustees of the singular donation which laid the foundation of the library. The library now contains 192,000 volumes and 1,880 MSS., and about 3,000 volumes are added every year.

France.—French libraries (other than those in private hands) belong either to the state, to the departments, to the communes, or to learned societies, educational establishments, and other public institutions; the libraries of judicial or administrative bodies are not considered to be owned by them, but to be state property. Besides the unrivaled library accommodation of the capital, France possesses a remarkable assemblage of provincial libraries. The communal and school libraries also form striking features of the French free library system.

The Bibliothèque Nationale in Paris (still the most extensive library in the world) has had an advantage over all others in the length of time during which its contents have been accumulating, and in the great zeal shown for it by several kings and other eminent men. Enthusiastic writers find the original of this library in the MS. collections of Charlemagne and Charles the Bald, but these were dispersed in course of time, and the few precious relics of them which the national library now possesses have been acquired at a much later date. Of the library which St. Louis formed in the thirteenth century (in imitation of what he had seen in the East) nothing has fallen into the possession of the Bibliothèque Nationale, but much has remained of the royal collections made by kings of the later dynasties. The real foundation of the institution (formerly known as the Bibliothèque du Roi) may be said to date from the reign of King John, the Black Prince's captive, who had a considerable taste for books.

The official estimate of the number of volumes in the *Département des Imprimés* now reaches the extraordinary total of about 2,200,000, but the contents have not been actually counted since 1791, and as the above enumerates pieces of which many are included in one volume, perhaps something like 1,827,000 is nearer the proper number. The annual additions are about 45,000. The *réserve* (consisting of articles of the highest importance) extends to more than 50,000 volumes. The collection of books on French history is in itself an enormous library, amounting to 440,000 volumes. The maps and charts, said to number 300,000, are included in this department. The *Département des MSS.* comprehended, in 1876, 91,700 volumes. The *Département des Médailles* possessed, in 1873, 143,030 coins, medals, engraved stones, etc., and since that date has acquired many important accessions. More than 2,200,000 engravings are in the *Département des Estampes*, where 20,000 pieces are annually received under the

copyright law. The annual vote for purchases and binding is 200,000 francs (\$40,000).

Paris is much better provided than London or any other city in the world with great public libraries. Besides the Bibliothèque Nationale there are four libraries, each over 120,000 volumes (with others less extensive), to which the public have free access, the Bibliothèque de l'Arsenal being the largest of them.

Germany (with Austria and Switzerland).—Germany is emphatically the home of large libraries; her want of political unity and consequent multiplicity of capitals have had the effect of giving her a considerable number of large state libraries, and the number of her universities has tended to multiply considerable collections.

Berlin is well supplied with libraries, seventy-two being registered by Petzholdt in 1875, with about 1,293,030 printed volumes. The largest of them is the Royal Library, which was founded by the "Great Elector" Frederick William, and opened as a public library in a wing of the electoral palace in 1661. From 1699 the library became entitled to a copy of every book published within the royal territories, and it has received many valuable accessions by purchase and otherwise. It is now estimated to contain upward of 700,000 printed volumes and over 15,000 MSS. The amount yearly expended upon binding and the acquisition of books, etc., is \$24,000.

The libraries of Munich, though not so numerous as those of Berlin, include two of great importance. The Royal Library, the largest collection of books in Germany, was founded by Duke Albrecht V. of Bavaria (1550-79) who made numerous purchases from Italy, and incorporated the libraries of the Nuremberg physician and historian Scedel, of Widmannstadt, and of J. J. Fugger. The number of printed volumes is estimated at about one million, although it is long since any exact enumeration has been made. The library is especially rich in incunabula, many of them being derived from the libraries of the monasteries closed in 1803. The Oriental MSS. are numerous and valuable, and include the library of Martin Haug. The University Library was originally founded at Ingolstadt in 1472, and removed with the university to Munich in 1826. It participated in 1803 in the division of the literary treasures of the disestablished monasteries. At present the number of volumes in the general library amounts to 290,000, besides which several special collections are also deposited in the library to the number of 32,800 volumes. The MSS. number 1,744. The various libraries of Munich have upward of 1,400,000 volumes.

The largest library in Austria, and one of the most important collections in Europe, is the Imperial Public Library at Vienna, apparently founded by the emperor Frederick III., in 1440, although its illustrious librarian Lambecius, in the well-known inscription over the entrance to the library which summarizes its history, attributes this honor to Frederick's son Maximilian. However this may be, the munificence of succeeding emperors greatly added to the wealth of the collection, including a not inconsiderable portion of the dispersed library of Corvinus. Since 1808 the library has also been entitled to the copy privilege in respect to all books published in the empire. The sum devoted to the purchase of books is 26,250 florins annually. The main library apartment is one of the most splendid halls in Europe. Admission to the reading-room is free to everybody, and books are also lent out under stricter limitations. The University library of Vienna was established by Maria Theresa. The reading-room is open to all comers, and the library is open much longer than is the rule with university libraries generally. In winter, for instance, it is open from five to eight in the even-

ing, and it is even open from nine to twelve on Sundays. In 1870, 159,768 volumes were used in the library, 16,300 volumes lent out in Vienna, and 4,418 volumes sent carriage free to borrowers outside of Vienna. The total number of libraries in Vienna enumerated by Doctor Petzholdt is 101, and many of them are of considerable extent.

The public libraries of Switzerland have been very carefully registered by Dr. Ernest Heitz, as they existed in 1860. Altogether no less than 2,096 libraries are recorded; four-fifths of these belong to the class of "bibliothèques populaires et celles pour la jeunesse," and few are of literary importance. Only eighteen have as many as 30,000 volumes. The largest collection of books in Switzerland is the University Library of Basel, founded with the University in 1460. The monastic libraries of St. Gall and Einsiedeln date respectively from the years 830 and 946, and are of great historical and literary interest.

Italy.—As the former center of civilization, Italy is of course the country in which the oldest existing libraries must be looked for, and in which the rarest and most valuable MSS. are preserved. The Vatican at Rome and the Laurentian Library at Florence are sufficient in themselves to entitle Italy to rank before most other states in that respect, and the venerable relics at Vercelli, Milan, and La Cava bear witness to the enlightenment of the peninsula in times when other nations were slowly taking their places in the circle of Christian polity. The local rights and interests which so long helped to impede the unification of Italy were useful in creating and preserving at numerous minor centers many libraries which otherwise would probably have been lost during the progress of absorption that results from such centralization as exists in England. In spite of long centuries of suffering and of the aggression of foreign swords and foreign gold, Italy is still rich in books and MSS.; there are probably more books in united Italy than in any other country except France. When the Italian government published its valuable report on "Biblioteche" in the *Statistica del Regno d'Italia* in 1865, a table of relative statistics was given, which professed to show that, while the number of books in Austria (2,408,000) was greater than the total contents of the public libraries in any one of the countries of Great Britain, Prussia, Bavaria, or Russia, it was surpassed in France (4,389,000) and in Italy (4,149,281), the latter country thus exhibiting a greater proportion of books to inhabitants than any other state in Europe, except Bavaria. The opulent libraries of Rome and Venice had not yet become Italian, and were not included in the report.

The Biblioteca Vaticana stands in the very first rank among European libraries as regards antiquity, since from the middle of the fifth century we have evidence of the existence of a pontifical library at Rome; and Pope Zachary (d. 752), himself a Greek, is known to have added considerably to the store of Greek codices. The Lateran Library shared in the removal of the papal court to Avignon, and it was on the return of the popes to Rome that the collection was permanently fixed at the Vatican. Nicholas V. (d. 1455) may, however, be considered the true founder of the library, and is said to have added 5,000 MSS. to the original store. Calixtus III. also enriched the library with many volumes saved from the hands of the Turks after the siege of Constantinople. So large a proportion of the printed books of the fifteenth century having been produced by the Italian presses, it is natural to expect that a great number of specimens may be found in the papal library, and, but for the wholesale destruction of books and MSS. during the sack of Rome by the duke of Bour-

bon in 1527, the Vatican Library would have been as rich in early printed literature as it is now rich in manuscripts.

Few libraries are so magnificently housed as the Biblioteca Vaticana. The famous *Codici Vaticani* are placed in the *salone* or great double hall, which is decorated with frescoes depicting ancient libraries and councils of the church. At the end of the great hall an immense gallery, also richly decorated, and extending to 1,200 feet, opens out from right to left. Here are preserved in different rooms the codici Palatini, Regin., Otoboniani, Capponiani, etc. Most of the printed books are contained in a series of six chambers known as the *Appartamento Borgia*. The printed books only are on open shelves, the MSS. being preserved in closed cases.

The present official estimate of the number of printed volumes is about 220,000, including 2,500 fifteenth-century editions, of which many are vellum copies, 500 Aldines, and a great number of bibliographical rarities. There are 25,600 MSS., of which 19,641 are Latin, 3,613 Greek, 609 Hebrew, 900 Arabic, 460 Syriac, 78 Coptic, etc. Among the Greek and Latin MSS. are some of the most valuable in the world, alike for antiquity and intrinsic importance. It is sufficient to mention the famous Biblical *Codex Vaticanus* of the fourth century, the *Virgil* of the fourth or fifth century, the *Terence* equally ancient, the palimpsest *De Republica* of Cicero, conjectured to be of the third century, discovered by Cardinal Mai, and an immense number of richly ornamented codices of extraordinary beauty and costliness. The archives are apart from the library, and are quite inaccessible to the public; no catalogue is known to exist. Leo XII. has appointed a committee to consider what documents of general interest may expediently be published, and a greater liberality in the use of them is said to be contemplated.

Belgium and Holland.—The national library of Belgium is the Bibliothèque Royale at Brussels, of which the basis may be said to consist of the famous Bibliothèque des Ducs de Bourgogne, the library of the Austrian sovereigns of the Low Countries, which had gradually accumulated during three centuries. After suffering many losses from thieves and fire, in 1772 the Bibliothèque de Bourgogne received considerable augmentations from the libraries of the suppressed order of Jesuits, and was thrown open to the public. On the occupation of Brussels by the French in 1794 a number of books and MSS. were confiscated and transferred to Paris (whence the majority were returned in 1815); in 1795 the remainder were formed into a public library under the care of La Serna Santander, who was also town librarian, and who was followed by Van Hulthem. At the end of the administration of Van Hulthem a large part of the precious collections of the Bollandists was acquired. In 1830 the Bibliothèque de Bourgogne was added to the state archives, and the whole made available for students.

The national library of Holland is the Koninklijke Bibliotheek at the Hague, which was established in 1798, when it was decided to join the library of the princes of Orange with those of the defunct government bodies in order to form a library for the States-General, to be called the National Bibliotheek. In 1805 the present name was adopted; and since 1815 it has become the national library.

Denmark, Norway, and Sweden.—The commencement of the admirably managed national library of Denmark, the great Royal Library at Copenhagen, may be said to have taken place during the reign of Christian III. (1533-59), who took pride in importing foreign books and choice MSS.; but the true founder was

Frederick III. (1648-70); to him is mainly due the famous collection of Icelandic literature and the acquisition of Tycho Brahe's MSS. The present building (in the Christiansborg Castle) was commenced in 1667. Among notable accessions may be mentioned the collections of C. Reitzler, the count of Danneskjöld (8,000 volumes and 500 MSS.), and Count de Thott; the last bequeathed 6,039 volumes printed before 1531, and the remainder of his books, over 100,000 volumes, were eventually purchased. In 1793 the library was opened to the public, and it has since remained under state control. Two copies of every book published within the kingdom must be deposited here. The incunabula and block books form an important series. There is a general classified catalogue in writing in 295 folio volumes for the use of readers; and an alphabetical one on slips arranged in boxes for the officials.

Spain and Portugal.—The chief library in Spain is the Biblioteca Nacional (formerly the Biblioteca Real) at Madrid. The printed volumes number 400,000 volumes, with 200,000 pamphlets; the accessions in 1880 amounted to 25,840 articles. Spanish literature is of course well represented, and, in consequence of the numerous accessions from the libraries of the suppressed convents, the classes of theology, canon law, history, etc., are particularly complete. The number of bibliographical rarities was largely increased by the incorporation of the valuable collection formed by the well-known bibliographer Don Luis de Usó. There are 30,000 MSS., contained in 10,000 volumes and bundles; they include some finely illuminated codices, historical documents, and many valuable autographs.

Among the libraries of Portugal the Bibliotheca Nacional at Lisbon naturally takes the first place. In 1841 it was largely increased from the monastic collections, which, however, seem to have been little cared for according to a report prepared by the principal librarian three years later. There are now said to be 200,000 volumes of printed books, among which theology, canon law, history, and Portuguese and Spanish literature largely predominate. The MSS. number 9,415, including many of great value. There is also a cabinet of 40,000 coins and medals.

Russia.—The Imperial Public Library at St. Petersburg is the third largest library in the world, and now claims to possess 1,000,000 printed volumes. The official estimate of the number of printed books is 1,000,000 volumes, with 19,059 maps and 75,000 prints and photographs. The yearly accessions amount to about 28,000. The Russian books number 100,000 and the Russia 30,000 volumes; the Aldines and Elzevirs form a nearly perfect collection; and the incunabula are numerous and very instructively arranged.

The manuscripts include 26,000 codices, 41,340 autographs, 4,689 charters, and 576 maps. The glory of this department is the celebrated *Codex Sinaiticus* of the Greek Bible, brought from the convent of St. Catharine on Mount Sinai by Tischendorf in 1859.

British Colonies.—Of such libraries as may be found in the British colonies there are very few that call for particular mention here.

The largest collection of books in Canada is the library of parliament at Ottawa. Though founded in 1815 it contained very few books until 1841, when the two libraries of Upper and Lower Canada were joined. After being destroyed by fire, the library was reestablished in 1855, chiefly for parliamentary use. It now contains 100,000 volumes. Books are lent out. The main library is a handsome octagonal apartment with beautiful carved work in Canadian whitewood.

In the South African Public Library at Cape Town, which was established in 1818, there are 39,000 volumes,

including the collection bequeathed by Sir George Grey, comprising, besides MSS. and early printed books, an unrivaled collection of works in the native languages of Africa, Australia, etc. The library is open to any respectable person.

The largest library in the Australian colonies is the Public Library of Victoria at Melbourne, which was established in 1853. In 1881 it numbered 89,387 volumes with 22,257 pamphlets; it possesses a collection of works on Australasia. The library has a printed catalogue (1880). It is supported by an annual parliamentary vote, which amounted in 1881 to £5,495. Readers are admitted without any formality, and have free access to the shelves. Although books are not lent out of the library individually, there is a system by which parcels of from 100 to 400 books are lent to libraries, mechanics' institutes, etc., in the inland towns of Victoria. There are several other not inconsiderable libraries in Melbourne. Next in importance to the Melbourne Library is the Sydney Free Public Library, which is said to contain the largest collection of works on Australasia anywhere to be found. It has a lending as well as a reference department, and is much used.

United States.—The libraries of the United States, as we should expect to find in a country where intelligence and education are so widely diffused, are exceedingly numerous. It is, of course, true that the great majority of these libraries are not numerically important. On the other hand, many of them are very rapidly growing, and their very youth implies that their shelves are not burdened with much obsolete literature. The recent development of American libraries is indeed very striking. Of the libraries reported in 1875, about sixty-four appear to have been established before 1800, and thirty of these between 1775 and 1800. Between 1800 and 1825 there were established 179 libraries, between 1825 and 1850 as many as 551, and finally between 1850 and 1875 no less than 2,240, which in the latter year contained as many as 5,481,068 volumes. Up to 1800 the rate of increase has been fully kept up. It will be convenient to deal with these libraries in groups according to the historical order of their development. The earliest libraries formed were in connection with educational institutions, and the oldest is that of Harvard (1638). It was destroyed by fire in 1764, but active steps were at once taken for its restoration. From that time to the present, private donations have been the great resource of the library. In 1840 the collection was removed to Gore Hall, which was erected for the purpose with a noble bequest from Christopher Gore, formerly governor of Massachusetts. There are also nine special libraries connected with the different departments of the university. The total number of volumes in all these collections is 304,753, exclusive of over 200,000 pamphlets. The annual increase is about 7,000 volumes, and the library has an endowment fund of over \$200,000. There is a MS. card-catalogue in two parts, by authors and subjects, which is accessible to the readers. The only condition of admission to use the books in Gore Hall is respectability; but only members of the university and privileged persons may borrow books. The library of Yale College, New Haven, was founded in 1700, but grew so slowly that, even with the 1,000 volumes received from Bishop Berkeley in 1733, it had only increased to 4,000 volumes in 1766, and some of these were lost in the revolutionary war. During the present century the collection has grown more speedily, and now the main library numbers 102,000 volumes, while the special libraries in the control of the college bring up the total to 175,000 volumes. The yearly increase is about 4,500 volumes, and the library

has a book fund of \$100,000. Among the other important university libraries are those of the college of New Jersey (Princeton), Dartmouth College (Hanover), Amherst College, Cornell University, and Brown University, (Providence, R. I.)

The establishment of proprietary or subscription libraries runs back into the first half of the eighteenth century, and is connected with the name of Benjamin Franklin. It was at Philadelphia, in the year 1731, that he set on foot what he calls "his first project of a public nature, that for a subscription library." * * * The institution soon manifested its ability, was imitated by other towns and in other provinces." The Library Company of Philadelphia was soon regularly incorporated, and gradually drew to itself other collections of books, including the Loganian Library, which was vested in the company by the State legislature in 1792 in trust for public use. Hence the collection combines the character of a public and of a proprietary library, being freely open for reference purposes, while the books circulate only among the subscribing members. It numbers at present 145,000 volumes, of which 11,000 belong to the Loganian Library, and may be freely lent. The printed classed catalogue of the library has been praised by Brunet and Allibone. In 1869 Dr. James Rush left a bequest of over \$1,000,000 for the purpose of erecting a building to be called the Ridgeway branch of the library. The building is very handsome, and has been very highly spoken of as a library structure. Philadelphia has another large proprietary library—that of the Mercantile Library Company, which was established in 1821. It possesses 152,135 volumes, and its members have always enjoyed direct access to the shelves. The library of the Boston Athenæum was established in 1807, and numbers 149,000 volumes. It has published an admirable dictionary catalogue. The collection is especially rich in art and in history, and possesses a part of the library of Washington. The Mercantile Library Association of New York, which was founded in 1810, has the largest of all the subscription libraries, counting over 208,000 volumes. New York possesses two other large proprietary libraries, one of which claims to have been formed as early as 1700 as the "public" library of New York. It was organized as the New York Society Library in 1754, and has been especially the library of the old Knickerbocker families and their descendants, its contents bearing witness to its history. It contains about 100,000 volumes. The Apprentices' Library has about 63,000 volumes, and makes a special feature of works on trades and useful arts. It is maintained by the General Society of Mechanics and Tradesmen. Finally, the Brooklyn Library deserves mention, if only for its very useful and admirable catalogue, the printing of which was completed in December, 1880, and which embraces 83,800 volumes.

Although the state libraries of Pennsylvania and New Hampshire are known to have been established as early as 1777, it was not until some time after the Revolution that any general tendency was shown to form official libraries in connection with the state system. It is especially within the last thirty years that the number of these libraries has so increased that now every State and Territory possesses a collection of books and documents for official and public purposes. These collections depend for their increase upon annual appropriations by the several States, and upon a systematic exchange of the official publications of the general government and of the several States and Territories. The largest is that of the State of New York at Albany, which contains 128,000 volumes, and is composed of a general and a law library, of which a printed catalogue has been published with full subject-indexes. The state

libraries are libraries of reference, and only members of the official classes are allowed to borrow books, although any well-behaved person is admitted to read in the libraries.

In addition to the libraries maintained by the several States, there are the collections belonging to the general government, most of which are at Washington. The most important of them is, of course, the library of congress, but there are also considerable libraries attached to the house of representatives, the senate, the department of state, the patent office, and the office of the surgeon-general.

The library of congress was first established in 1800 at Washington, and was burned together with the capitol by the British army in 1814. President Jefferson's books were purchased to form the foundation of a new library, which continued to increase slowly until 1851, when all but 20,000 volumes were destroyed by fire. From this time the collection has grown rapidly, and now consists of 396,000 volumes with 130,000 pamphlets. In 1866 the library of the Smithsonian institution, consisting of 40,000 volumes, chiefly in natural science, was transferred to the library of congress. The library is specially well provided in history, jurisprudence, the political sciences and Americana. Since 1832 the law collections have been constituted into a special department. This is the national library. In 1870 the registry of copyrights was transferred to it under the charge of the librarian of congress. As two copies of every publication which claims copyright are required to be deposited in the library, the receipts under this head are over 25,000 articles per annum. The sum annually appropriated by congress for the management and increase of the library is \$52,840. The present accommodation is inadequate, and a separate building is to be erected of size to contain 2,000,000 volumes. There is an alphabetical card-catalogue kept constantly up to date, and a printed catalogue of subject-matters. The library is open every day in the year, except on four legal holidays, from 9 A.M. to 4 P.M., and admission is granted to all persons over sixteen years of age without formality or introduction, but books are only lent to members of the official classes.

Since the organization of the government, in 1789, no less than 160 historical societies have been formed in the United States, most of which still continue to exist. Many of them have formed considerable libraries, and possess extensive and valuable manuscript collections. The oldest of them is the Massachusetts Historical Society, which dates from 1791.

The earliest of the scientific societies owes its origin to Franklin, and dates from 1743. The most extensive collection is that of the Academy of Natural Sciences of Philadelphia, which consists of 35,000 volumes and 40,000 pamphlets. For information as to the numerous professional libraries of the United States—theological, legal, and medical—the reader may be referred to the tables appended.

Of all the libraries of the United States none have achieved a greater fame, and none are more zealously and admirably conducted, than those which are supported from the public funds of some of the great cities. Legislation on the subject of free public libraries was almost synchronous in England and America. Of the free town libraries of America much the largest and most successful is the Boston Public Library, which was established in 1852. Besides the liberal appropriations made by the city for its support, it has been the object of a long series of splendid gifts in money and books. Among the more conspicuous of its benefactors have been Joshua Bates, Theodore Parker, and George

Ticknor. Since the library has been opened to the public there has thus been gathered "the largest collection of books, under one administration, upon this continent." The number of volumes in the library on July 1, 1889, was 453,967, and the annual accessions are over 17,000 volumes. In addition to the income available from trust funds the annual appropriation by the city is \$115,000. Besides the Central Library, with the Bates Hall and Lower Hall, there are ten branches, and the total circulation is considerably over 1,000,000 volumes per annum. Any inhabitant of Boston over fourteen years of age is admitted to read in the library and borrow books. The principal catalogue of the library is upon cards, in addition to which there are printed catalogues of special collections and a perfect multitude of useful class catalogues and bibliographical helps of various kinds. The library is open to readers from 9 A.M. to 6 P.M. from October to March, and until 7 P.M. during the rest of the year. Books are delivered for home use until 9 in the evening. The periodical room is open from 9 A.M. to 9 P.M. on week days, and on Sundays from 2 to 9. A new building is in contemplation.

Of the remaining free town libraries the most important are those of Cincinnati and Chicago. The public library of Cincinnati, which was established on its present footing in 1867, has 158,930 volumes, besides pamphlets. The reading-rooms are open every day in the year from 8 A.M. to 10 P.M. The library buildings were completed in 1873 at a cost of about \$400,000, and are "among the handsomest in the world." The Chicago Public Library was established in 1872, and owed its origin to the sympathy felt for Chicago in England after the great fire of 1871. The number of volumes now in the library is 155,238. There is a very full and minute card-catalogue, in one alphabet, of authors and subjects; the contents of collections, volumes of essays, etc., are analyzed under their subjects. The reading-room is open 365 days in the year from 9 A.M. to 9 P.M., and is not even closed for the purpose of taking stock or cleaning. The library has not yet an appropriate building. In addition to this library Chicago will soon have two other libraries, the Newberry and the Crerar, founded by bequests from two gentlemen bearing the names given above. Of smaller free town libraries there is a considerable number, especially in Massachusetts.

We cannot conclude this brief sketch without mentioning some notable illustrations of that public-spirited munificence which is nowhere perhaps so frequently found as in the United States. The Astor Library in New York was founded by a bequest of John Jacob Astor, whose example was followed successively by his son and grandson. The library was opened to the public in 1854, and at the end of 1889 the collection due to their joint benefaction contained 225,000 volumes. It consists of a careful selection of the most valuable books upon all subjects. It is a library of reference, for which purpose it is freely open, and books are not lent out. It is "a working library for studious persons," and such persons on a proper introduction are allowed to pursue their studies in the alcoves. The total endowment is over \$1,100,000. There is a printed catalogue for about half the library, with a printed index of subjects, and a similar catalogue for the rest is in preparation. The Lenox Library was established by Mr. James Lenox in 1870, when a body of trustees was incorporated by an act of the legislature. In addition to the funds intended for the library building and endowment, amounting to \$1,247,000, the private collection of books which Mr. Lenox had long been accumulating is extremely valuable. Though it does not rank high in point of mere numbers, it is exceedingly rich in early books on America, in Bibles,

in Shakesperiana, and in Elizabethan poetry. The Peabody Institute at Baltimore was established by Mr. George Peabody in 1857, and contains a reference library open to all comers, numbering about 84,000 volumes. The Institute has an endowment of \$1,000,000, which, however, has to support, besides the library, a conservatory of music, an art gallery, and courses of popular lectures. The largest legacies yet made for public libraries have recently fallen to the citizens of Chicago in the Newberry bequest of over \$2,000,000 for the founding of a free public library in the north

division of Chicago, and in the latter part of 1889, John Crerar, a prominent manufacturer of Chicago, died, leaving by will almost all his fortune in trust for library purposes. It is believed that the amount to be realized under this bequest will suffice for the construction and furnishing of a library equaling or excelling that provided for by the Newberry legacy. The latest and most princely benefactor of American libraries is Mr. Andrew Carnegie, to whose philanthropies and gifts, very many cities and institutions in the United States are immensely indebted.

TABLES OF THE PRINCIPAL LIBRARIES THROUGHOUT THE WORLD.

I.—LIST OF LIBRARIES IN THE UNITED STATES HAVING OVER 20,000 VOLUMES.

Location.	Name.	F'und'd	Character and Remarks.	Volumes.	
Albany, N. Y.....	New York State Library.....	1818	General reference.....	128,529	Open (over 15).
Amherst, Mass.....	Amherst College Library.....	1811	General.....	47,000	Members; o. b. p.
Andover, Mass.....	Theological Seminary Library.....	1807	Theology.....	43,000	Members.
Ann Arbor, Mich....	University of Michigan Library...	1841	General reference.....	58,091	Open.
Annapolis, Md.....	Maryland State Library.....	1826	Law.....	70,000	Open.
Augusta, Me.....	Maine State Library.....	1832	General reference, Law.....	40,000	Members Gov't.
Baltimore.....	Johns Hopkins University Lib....	1876	Science, History, etc.....	28,000	Members.
".....	Maryland Historical Society Lib....	1844	History.....	20,000	Open.
".....	Mercantile Library Association.....	1839	General.....	36,000	Sub. (\$5).
".....	Peabody Institute Library.....	1876	General reference.....	84,726	Open (over 16).
Boston.....	Boston Athenæum Library.....	1807	General reference.....	149,970	Property; books;
".....	Congregational Library.....	1853	Theology, History.....	31,381	Open. bor. (\$5).
".....	Mass. Historical Society Library..	1791	History.....	29,000	Members (100).
".....	New England Historical Genealo-				
".....	gical Society Library.....	1845	History, Biography, Gen...	20,778	Open.
".....	Public Library (10 branches).....	1852	Books lent.....	453,907	Open (over 14).
".....	State Library of Massachusetts.....	1826	Ref., Law and History.....	60,000	Open.
Brooklyn.....	Brooklyn Library.....	1857	Books lent.....	83,888	Members.
".....	Long Island Hist. Society Library	1863	Reference, Hist., Fine Arts.	40,000	Members.
Brunswick, Me.....	Bowdoin College Library.....	1802	General reference.....	40,000	Members.
Buffalo.....	Buffalo Library.....	1836	Books lent.....	53,638	Sub. (\$3).
Cambridge, Mass. }	Harvard University Lib. (Central	1632 }	Ballads, Folk Lore, Amer-	304,753 }	Open for ref.;
".....	College and 9 Departments).....	1764 }	icana.....		mem. borrow.
Chicago.....	Public Library.....	1872	Books lent.....	258,498	Open.
".....	Crerar Library.....	1894	General reference.....	59,917	Open.
".....	Newberry Library.....	1887	General reference.....	157,131	Open.
Cincinnati.....	Public Library.....	1856 }	General, Medical, Theology.	158,136 }	Open.
".....	Young Men's Mercantile Library..	1835 }	Books lent.....	47,939 }	Sub. (\$5).
Cleveland.....	Public School Library.....	1868	Books lent to residents.....	45,995	Open.
Columbus, Ohio.....	Ohio State Library.....	1817	General reference, Law.....	51,439	Open.
Detroit, Mich.....	Public Library.....	1865	Books lent; 3 MSS.....	60,000	Open (over 15).
Evanston, Ill.....	Northwestern University Library..	1867	General, Classic, Philosoph.	25,000	Members.
Frankfort, Ky.....	Kentucky State Library.....	1821	General reference, Law.....	33,900	Open.
Georgetown, D. C..	Georgetown College Library.....	1791	Theo. and Col. course.....	30,000	Mem. & visitors.
Hanover, N. H.....	Dartmouth College Library.....	1769	General reference.....	65,000	Members (\$6).
Harrisburg, Pa.....	Pennsylvania State Library.....	1816	General reference.....	53,000	Open.
Hartford.....	Conn. Historical Society Library..	1825	History.....	20,000	Open by permis-
".....	Hartford Library Association.....	1830	Books lent.....	34,500	Sub. (\$5).
".....	Watkinson Library of Reference...	1858	General reference.....	34,899	Open.
Haverhill, Mass....	Public Library.....	1873	Books lent.....	39,268	Open (over 12).
Indianapolis.....	Public Library.....	1872	Books lent.....	39,273	Open.
Ithaca, N. Y.....	Cornell University Library.....	1868	Reference.....	60,300	Members.
Lansing.....	Michigan State Library.....	1828	General reference.....	54,000	Open.
Louisville.....	Polytechnic Society of Ky. Lib....	1879	Scientific.....	39,879	Members.
".....	Public Library of Kentucky.....	1871	.....	60,800	Open.
Lowell.....	City Library.....	1844	.....	30,100	Subscription.
Madison, Wis.....	Wis. State Historical Society Lib.	1849	General.....	55,361	Members (\$2).
Middletown, Conn..	Wesleyan University Library.....	1833	College course.....	35,000	Members.
New Bedford, Mass.	Free Public Library.....	1853	Books lent.....	48,600	Open (over 16).
New Haven.....	Yale College.....	1700	General reference.....	175,000	Members.
New York.....	Apprentices' Library.....	1820	General, Trades and Arts...	63,000	Open to apps. and
".....	Astor Library.....	1849	General reference.....	221,490	journeymen.
".....	Columbia College Library.....	1754	General reference.....	50,000	Open (over 16).
".....	Lenox Library.....	1870	Rare Books.....	25,000	Members.
".....	Mercantile Library Association.....	1820	Books lent.....	207,123	By card on appli.
".....	N. Y. Historical Society Library..	1804	History.....	75,000	Subscription.
".....	New York Society Library.....	1700 }	General.....	100,000 }	Members; o. b. p.
".....	Union Theological Seminary Lib....	1836 }	Theology.....	50,000 }	Members; o. b. p.
Philadelphia.....	Academy of Natural Science Lib..	1812	Natural History.....	35,000	Members; o. b. p.
".....	Library Company of Philadelphia.	1731	Loganian Library in Trust.	145,000	Sub.; ref. free.
".....	Mercantile Library Company.....	1821	Books lent.....	152,741	Sub. (\$4).
".....	College of Physicians.....	1789	Medical.....	55,079	Open.
Princeton, N. J.....	College of New Jersey Library....	1746	General reference.....	126,150	Members

I.—LIST OF LIBRARIES IN THE UNITED STATES HAVING OVER 20,000 VOLUMES—Continued.

Location.	Name.	Found'd	Character and Remarks.	Volumes.	
Princeton, N. J.....	Presbyterian Theo. Sem. Library..	1812	Reference; Theology.....	50,000	Members.
Providence.....	Brown University Library.....	1768	Rich in hist., fine arts, clas., and patr. lit.....	110,000	Members; o. b. p.
".....	Providence Athenæum Library....	1836	Books lent.....	44,502	Sub. (\$6).
".....	Public Library.....	.....	.....	31,650	Open.
Raleigh, N. C.....	North Carolina State Library.....	1831	General reference.....	42,000	Open.
Richmond, Va.....	Virginia State Library.....	1822	General reference.....	44,000	Open.
Sacramento.....	California State Library.....	1850	General reference.....	53,000	Open.
St. Louis.....	Public School Library.....	1865	Books borrow.....	59,192	.....
".....	St. Louis Mercantile Library.....	1846	General American History..	62,264	Subscription.
Salem, Mass.....	Essex Institute Library.....	1848	Reference, History.....	126,800	Members (350).
San Francisco.....	Free Public Library.....	1879	Books lent.....	45,004	Open.
".....	Mercantile Library Association....	{ 1853 } 1863	Books lent.....	53,858	Sub. (\$12).
South Bethlehem, Pa	L. P. Linderman Mem. Library....	1881	General reference.....	50,000	Open.
Springfield, Mass...	City Library Association.....	1864	Books lent.....	50,960	Open.
University of Va....	University of Virginia Library....	1825	College course.....	48,000	Open.
Washington.....	Bureau of Education Library....	1868	Education and libraries....	81,872	Use of dept.
".....	Department of State Library.....	1789	Reference, Law, History....	63,000	Use of dept.
".....	House of Representatives Lib....	1789	Public Document.....	198,000	.....
".....	Library of Congress.....	1800	National.....	1,000,000	Open (over 16.)
".....	Patent Office Library.....	1839	Technical, Patents.....	74,140	Open.
".....	Surgeon-General's Office Library.	1865	Medical, Science.....	72,219	Open.
".....	U. S. Senate Library.....	1852	Public Document.....	30,000	Senators.
Waterbury, Conn...	Silas Bronson Library.....	1870	General, Fine and Ind. Arts	36,500	Open.
West Point.....	U. S. Military Academy Library..	1812	Military and scientific....	30,000	Members.
Williamstown, Mass.	Williams College Library.....	1793	General reference.....	30,000	Members.
Worcester, Mass....	Amer. Antiquarian Society Lib....	1812	Reference, American Hist....	85,000	Open.
".....	Free Public Library.....	1859	Books lent to residents.....	61,204	Open (over 16).

II.—GREAT BRITAIN AND IRELAND.

Name.	Founded.	No. of Vols.		To whom Accessible.	Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.				Print.	MSS.	
ABBEY TAVISTOCK:					CAMBRIDGE:				
Public Library.....	1799	10,000	.....	Subscribers.	Cavendish Col. Library... 188—	.....	.....	.....	Members.
ABERDEEN:					Christ's College Library... 1508	13,000	Few.	.....	Members.
Free Church Col. Library..	.....	20,000	.....	Members.	Clare College Library.....	7,500	Few.	.....	Members.
Mechanics' Institute.....	1824	16,000	.....	Members.	Emmanuel College Library...	20,000	250	.....	Members.
University Library.....	.....	90,000	400	Members.	Fitzwilliam Museum Lib....	1816	9,760	159	Mem. of U.
ABROATH:									(o. b. l.)
Public Library.....	1797	13,000	.....	Subscribers.	Gonville and Caius College	1348	13,500	700	Members.
ARMAGH:					Jesus College Library.....	.....	9,500	100	.....
Public Library.....	1771	17,000	150	Open.	King's College Library...c.	1441	17,000	320	Members
BATH:									(o. b. l.)
Royal Lit. and Scien. Inst.	1825	10,000	30	Subscribers.	Magdalene College.....	.....	.....	.....	.....
BEKINGTON:					Pembroke College Library...	1400	14,000	300	.....
Mayer Free Library.....	1866	23,000	MSS.	Open.	Peterhouse Library.....	1418	9,000	300	Members.
BEDFORD:					Public Free Library.....	1853	24,747	.....	Open.
Literary and Scientific In.	1832	12,000	.....	Subscribers.	Queen's College Library...c.	1448	30,000	.....	Members.
BELFAST:					St. Catherine's College.....	.....	.....	.....	.....
Queen's College Library...	1849	35,797	.....	Mem. (o. b. l.)	St. John's College Library	1624	35,000	500	Members.
BILSTON:					Sidney Sussex College....	1598	5,000	100	Members.
Free Library.....	1873	8,000	.....	Open.	Trinity College Library...c.	1546	90,000	1,918	Members.
BIRKENHEAD:					Trinity Hall Library...c.	1350	7,000	.....	Members.
Free Public Library.....	1855	60,000	.....	Open.	Union Society.....	1816	20,000	.....	Members.
BIRMINGHAM:					University Library.....	14—	200,000	5,723	Mem. (o. b. l.)
Free Library.....	18—	100,000	200	Open.	CANTERBURY:				
Library (Union Street)...	1779	45,000	.....	Subscribers.	Dean and Chapter Library...	.....	9,900	110	Open.
BLACKBURN:					St. Augustine's College... 1848	15,000	150	.....	Members.
Free Library and Museum	1862	26,000	.....	Open.	CARDIFF:				
Stonyhurst College Library	1794	50,000	MSS.	Members.	Free Library.....	1862	14,000	.....	Open by guarantee.
BOLTON:					CHELTHENHAM:				
Public Library.....	1853	46,466	.....	Open.	Cheltenham Library.....	1863	11,265	.....	Subscribers.
BRADFORD:					CHESTER:				
Free Public Library.....	1871	32,056	.....	Open.	Free Public Library.....	1876	10,000	.....	Open.
Library and Lit. Society..	1774	17,500	.....	Members.	CHICHESTER:				
BRIGHTON:					Library Society.....	1794	6,500	.....	Subscribers.
Free Library.....	1875	26,000	.....	Open.	CLITHEROE:				
BRISTOL:					CORK:				
Bristol Baptist College....	1770	12,000	200	Open.	Queen's College Library..	1849	25,000	.....	Stud's. lit. inquirers.
Cathedral Library.....	16th cent	1,000	.....	Members.					
				(o. b. l.)	Royal Cork Institute.....	1807	14,000	.....	Open to inquirers.
Free Library.....	1613	46,000	Few.	Open.	COVENTRY:				
Museum and Library.....	1772	50,000	Few.	Subscribers.	Free Library.....	1868	22,000	.....	Open.
BURY:					DARWEN:				
Co-operative Provision Society's Library.....	1860	11,000	.....	Members.	Free Public Library.....	1871	8,000	Few.	Open

Name.	Founded.	No. of Vols.		To whom Accessible.	Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.				Print.	MSS.	
VERBY: Free Library and Museum	1877	13,000	.....	Open	GLASGOW (Continued). Stirling's and Glasgow Public Library.....	1791	50,000	.....	Free ref.: Sub. bor.
DEVONPORT: Free Public Library	1881	8,500	.....	Open.	University Library.....	15th cent	125,000	350	Mem.; lit. inq. by payt.
DONCASTER: Borough Free Library	1869	10,628	.....	Open.	GODALMING: Charterhouse School Lib.	1804	10,000	.....	Open to the boys.
DUBLIN: King's Inns Library.....	1787	58,000	Few	Law Stud., etc.	GREENOCK: Greenock Library.....	1783	20,000	.....	Subscribers.
King and Queen's College of Physicians.....	1711	12,000	Few.	Members, etc.	GREENWICH: Royal Naval College Lib.	1873	5,000	.....	Staff, Stud.
Law Library, Four Courts Mechanics' Institute.....	1816 1838	9,000 .....	.....	Subscribers.	HALIFAX: Mechanics' Institute	1825	12,000	.....	Subscribers.
National Library of Ire- land.....	1877	85,000	.....	Open by in- tro-duc-tion.	HANLEY: Potteries Mechanical Inst.	1826	7,000	.....	Subscribers.
Public Library, St. Pat- rick's.....	1877	18,000	200	Open by in- tro-duc-tion.	HARROW: School (Vaughn) L..ante	1819	8,000	Few.	Open to the boys.
Royal College of Science (Ireland).....	1867	8,500	.....	Open to in- quirers.	HEREFORD: Free Pub. Lib. and Mus.	1872	7,018	38	Open.
Royal College of Surgery.	1784	25,000	.....	Members.	Permanent Library.....	1815	7,000	.....	Subscribers.
Royal Dublin Society.....	1731	10,000	.....	By introd.	HEYWOOD: Public Free Library.....	1874	6,000	.....	Open.
Royal Irish Academy.....	1785	40,000	1,400	By introd.	HULL: Lyceum Library.....	1807	17,000	.....	Subscribers.
Trinity College Library ..	1602	192,000	1,880	Graduates (o. b. l.)	Subscription Library	1775	40,000	.....	Shareholder
ØUNDALK: Free Public Library.....	1858	6,000	.....	Open.	INVERNESS: Free Public Library.....	.....	.....	.....	.....
ØUNDEE: Free Library and Museum	1866	35,000	.....	Open.	KEIGHLEY: Mechanics' Institute.....	1825	7,000	.....	Subscribers.
DURHAM: Bishop Cosin's Lib.....	1669	4,456	188	Open; cler. borrow.	KELSO: Kelso Library.....	1751	8,000	.....	Subscribers.
Cathedral Library.....	.....	15,000	570	O. b. l.	KILMARNOCK: Library.....	1797	14,000	.....	Subscribers.
University Library.....	1833	31,168	.....	Mem. (o. b. l.)	LANGHOLM (Dumfries).....	1800	7,000	.....	Subscribers.
EDINBURGH: Advocates' Library.....	1680	265,000	3,000	To inquire.	LEAMINGTON: Free Public Library.....	1857	11,249	.....	.....
Literary Institute.....	1872	8,000	.....	Sub.	LEEDS: Leeds Library.....	1768	85,000	Few.	Shareholder
Mech. Subs. Library.....	1825	22,500	.....	Sub.	Mechanics' Institute.....	1842	20,000	.....	Subscribers.
New College Library.....	1843	40,000	200	Stud.	Public Library.....	1870	109,202	.....	Open.
Philosophical Institute.....	1846	30,000	.....	Sub.	LEICESTER: Free Library.....	1869	20,000	.....	Free.
Royal College of Phys.....	1681	26,000	.....	Mem.	Permanent Library.....	1779	10,000	.....	Subscribers.
Royal Medical Society.....	.....	20,000	.....	Mem.	LEWES: Library Society.....	1790	6,000	.....	Subscribers.
Royal Society Library.....	1737	15,300	.....	Mem.	LICHFIELD: Cathedral Library.....	.....	6,000	20	Clergy (o. b. l.)
Select Subscription Lib.....	1800	31,000	.....	Sub.	Free Library and Museum	1874	5,000	.....	Residents.
Signet Library.....	1755	65,800	.....	Mem., lit. inquir.	LINCOLN: Cathedral Library.....	.....	7,400	.....	Clergy of diocese.
Society of Antiquar. L.....	.....	9,000	.....	Mem.	LIVERPOOL: Athenæum.....	1798	30,000	.....	Proprietor.
S. S. C. Library.....	1808	12,000	.....	Mem.	Free Public Library.....	1852	R. 72,406 L. 43,285	.....	Open.
Subscription Library.....	1794	40,000	.....	Sharehold.	Library (Lyceum).....	1758	70,000	.....	Subscribers.
United Pres. Col. L.....	1847	21,000	.....	Stud'ts and Ministers.	Medical Institute.....	1823	8,000	.....	Medical men
University Library.....	1580	14,000	2,000	Mem.	LONDON: Admiralty Library.....	.....	25,000	.....	.....
ELY: Cathedral Library.....	.....	6,000	.....	By leave.	Anthropological Institute.	1844	4,000	.....	Members.
EXETER: Cathedral Library.....ante	900	6,000	.....	Clergy only	Athenæum Club.....	1824	48,000	.....	Members.
Dev. and E. Free Library.	1870	12,076	.....	Open.	Baptist College (Regent's Park).....	1810	10,000	.....	Students.
Devon and Exeter Inst.....	1813	22,000	.....	Sharehold and sub.	Bethnal Green F. Library.	1875	10,000	.....	Open.
GALWAY: Queen College Library....	.....	23,000	.....	Members. househo.	Birbeck Institute.....	1823	9,000	.....	Members.
GLASGOW: Anderson's College— (1) Ewing's Mus. Lib.. (2) Managers' Library.. (3) Mechanical Class L.	1878 1808	5,500 2,870 7,138	..... ..... .....	..... ..... Mem.; or by payt.	British and Foreign Bible Society.....	1805	10,000	280	.....
College of Sci. and Art.....	1823	8,000	.....	Stud. or by payt.	British Museum.....	1753	1,500,000	50,000 and 45,000 char- ters.	Free by tick- et over 21.
Faculty of Physicians and Surgeons.....	1690	20,000	50	Med. men; fellows borrow.	Chemical Society.....	1841	8,000	.....	Members.
Faculty of Procur. (1 branch).....	1817	10,861	.....	Members.	Christ's Hospital.....	.....	.....	.....	.....
Free Chi. College Lib.....	.....	24,000	.....	Mem. and Students.	Colonial Office.....	.....	12,000	.....	Officials.
Mitchell Library.....	1874	36,000	Few.	Free pub. rf.	Compositors' Library.....	1853	8,000	.....	Members.
Philosophical Society.....	1802	9,000	.....	Members.	Corporation Library (Guildhall).....	1824	80,000	300	Open.
					Dr. Williams' Library.....	1716	30,000	1,000	By intro&

Name.	Founded.	No. of Vols.		To whom Accessible.	Name	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.				Print.	MSS.	
Dulwich College Library..	1619	7,000	1,173	Masters and 6th form.	MANCHESTER:				
Foreign Office Library....		70,000		Officials.	Athenæum Library....	1835	18,511		Subscribers.
Geological Society.....	1807	17,500		Fellows.	Chetham's Library....	1053	40,000	300	Open.
Gray's Institution..... <i>ante</i>	1555	13,000	23	Members.	Free Public Library....	1852	R65,000	Few.	Open.
Guy's Hospital.....	1825	5,197		Staff, Stud.			L85,000		
Herald's College Library..					Grammar School.....		5,000		Boys.
Home Office.....	1800	5,000		Officials.	Lancashire Indep. College				
House of Commons.....	1818	40,000		M. P.'s.	Library.....	1816	11,000	20	Stud. (o.b.l.)
House of Lords.....		30,000		Peers.	Mechanical Institute....		14,500		Members.
Incorporated Law Society.	1831	30,000	Few.	Mem. and Subscribers.	Medical Society Library..	1834	24,000		Subscribers.
India Office.....	1801	40,000	10,000	Indian Officials (o. b. l.)	Owens College Library...	1851	31,000	Many	Stud. (o.b.l.)
Inner Temple..... <i>ante</i>	1540	36,000	600	Members.	Portico Library.....	1804	30,000		Subscribers.
Institn. of Civil Engineers	1818	17,000		Mem. and Students.	MARLBOROUGH COLLEGE:				
King's College Library....	1830			Students.	Adderley Library.....	1848	7,400		5th and 6th forms.
Lambeth Palace Library..	1610	30,000	14,000	Open.	MAYNOOTH COLLEGE.....	1795	40,000	Few.	Stud. (o.b.l.)
Lincoln's Inn.....	1497	45,000	Many.	Members.	MIDDLESBROUGH:				
Linnean Society.....					Free Library.....	1871	9,500		Open.
London Institution.....	1805	70,000	Few.	Sub. (o. b. l.)	NEWCASTLE-ON-TYNE:				
London Library.....	1841	90,000		Subscribers.	Literary and Philosophical				
Medical Society.....	1773	11,200	300	Members.	Society.....	1793	60,000		Subscribers.
Meteorological Office.....	1855	6,000		Officials.	Public Library.....	1874	25,000		Burgesses and Resi.
Middle Temple.....	1641	30,000	Few.	Members.					
Museum of Prac. Geology.	1843	30,000		By introd.	NEWPORT:				
Notting Hill Free Public					Free Library.....	1870	6,734		Residents.
Library.....	1874	5,000		Open.	NORTHAMPTON:				
Oratory, Brompton.....	1849	18,000		Members.	Free Library.....	1876	11,000		Residents.
Patent Office Library....	1855	80,000		Open.	NORWICH:				
Pharmaceutic Society....	1841	8,000	Few.	Members.	Cathedral Library.....		5,700		Dioc. cler.
Reform Club.....	1841	30,000		Members.	Free Library.....	1854	6,000		Open.
Royal Academy of Arts....	1769	5,500		Mem. (o.b.l.)	Norfolk and Norwich Lit-				
Royal Asiatic Society....	1823	12,750	750	Members.	erary Institute.....				
Royal Astron. Society....	1820	8,000	300	Members.	Public Library.....	1784	45,000		Subscribers.
Royal Coll. of Physicians.	1525	16,000	200	Members.	NOTTINGHAM:				
Royal Coll. of Surgeons...	1801	42,500		Members.	Free Public Library.....	1867	26,000		Open.
Royal Geograph. Society.	1832	Over			OSCOTT:				
		20,000		Fell. (o. b. l.)	St. Mary's College Library.	1839	20,238	70	
Royal Institute of British					OXFORD:				
Architects.....	1834	6,700		Members. (o. b. l.)	All Souls Library.....	1443	40,000	300	Grad., etc.
Royal Institution.....	1803	40,000	Few.	Members.	Balliol College Library...	15th cent	400,000	30,000	Graduates (o.b.l.)
Royal Medical and Chir-					Bodleian Library.....	1602			
urgical Society.....	1805	32,000	Few.	Fell.; on introd.	Brazenose Coll. Lib.. <i>ante</i>	1520	12,000		Fellows (o.b.l.)
Royal Society.....	1665	40,000		Fellows.	Christ Church Library....		33,000	337	Members (o.b.l.)
Royal Soc. of Literature..	1820	8,000		Members.	Corpus College Library...				
Royal United Service In-					Exeter College Library...	1314	25,000		Fellows (o.b.l.)
stitution.....	1831	20,000	Few.	Officers of A. and N.	Hertford College Library.				
Russell Institution.....	1808	17,500		Subscribers.	Jesus College Library...c	1621	7,000	141	Fellows (o.b.l.)
Sacred Harmonic Society.		4,851		By leave.	Keble College Library....	1870	8,600	10	Members.
St. Bartholomew's Hospit.	1667	8,000		Students.	Lincoln College Library...		15,000		
St. Paul's Cath. Library...		8,700		Cath. body.	Magdalen College Library.	1458	22,500	250	Fellows (o.b.l.)
St. Thomas' Hospital.....		5,000		Students.	Merton College Library..c	1370	12,000	350	Mem. (o.b.l.)
Sion College.....	1629	50,600	Few.	Lond. Clergy by sub.	New College Library.....	1386	17,000	350	Members.
Sir J. Soane's Museum...					Oriel College Library.....			82	
Society of Antiquaries...	1707	20,000		Fellows.	Public Library.....	1854	7,000		By guardian
S. Kensington Museum—					Queen's College Library..	1400	50,000	400	Fellows (o.b.l.)
(1) Educational Library.	1857	42,190		Teachers, Stud., Sub.					
(2) National Art Library.	1852	56,000		"	Radcliffe Library.....	1749	30,000		M. of Univ.
(3) Dyce Library.....	1869	14,500	MSS.	"	St. Edmund Hall.....		Small.		Members.
(4) Forster Library.....	1876	19,000	MSS.	"	St. John's College Library.		20,000	210	Fellows (o.b.l.)
Statistical Society.....	1834	10,000	Few.	Members.	Taylor Institute Library..	1848	30,000	110	M. of Univ. (o.b.l.)
University College.....	1828	100,000		Stud.; others by introd.	Trinity College Library...	1554			Fellow, etc. (o. b. l.)
University of London.....	1837	11,000		Membeas. (o. b. l.)	Union Society.....	1836	17,000		Members.
War Office.....		25,000		Officials.	University College Library.				
Westminster—					Wadham College Library..	1613	16,000		
Free Public Library....	1857	13,527		Open.	Worcester College Library.	1714	23,000		Residents
Dean & Chapter Library		11,000		Chapter.					M.A.s.
Zoological Society.....		9,000	25	Members.	PAISLEY:				
LYNN:					Free Public Library.....	1870	19,000	160	Open.
Stanley Library.....	1854	17,000		Subscribers.	PEEBLES:				
MACCLESFIELD:					Chambers' Institute.....	1859	15,000		Sub. only.
Free Library.....	1876	10,000		Open.	PENZANCE:				
MADELEY:					Public Library.....	1818	15,400		Subscribers.
Free Library.....					PERTH:				
MAIDSTONE:					Mechanics' Library.....	1823	7,000		Subscribers.
Mus. and Public Library..	1858	10,000		Open.	Perth Library.....				

Name.	Founded.	No. of Vols.		To whom Accessible.	Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.				Print.	MSS.	
PLYMOUTH:					WINCHESTER:				
Free Public Library.....	1876	15,000	.....	Open.	Cathedral Library.....	1684	4,500	15	Dioc. Cler.
Proprietary and Cottonian Library.....	1820	16,084	.....	Proprie. and Sub.	WINDSOR:				
					Eton College Library.....	15th cent	23,000	100	Masters; Par. Cler. Boys.
PRESTON:					Eton School Library.....	1821	8,000	.....	.....
Free Public Library.....	1879	10,000	.....	Open.	Royal Library.....	By Wil IV.	70,000	.....	.....
Dr. Shepherd's Library...	1762	11,622	54	Order from alderman.	WOLVERHAMPTON:				
					Free Library.....	1869	24,500	.....	.....
READING:					WORCESTER:				
Free Library.....	1875	6,000	.....	Open.	Public Library.....	1880	12,000	.....	Non-resi. by sub
RICHMOND:					YORK:				
Free Public Library.....	1881	7,000	.....	Residents.	Minster Library.....	.....	11,000	300	Open by l. Members.
Wesleyan Theological Institute	1843	14,000	.....	Staff and Stud.	Subscription Library.....	1794	40,000	.....	.....
RIPON:									
Minster Library.....	1624	5,340	.....	Clergy (o.b.l.)					
ROCHDALE:									
Equitable Pioneers' Society.....	1849	14,475	.....	Members.					
Free Public Library.....	1872	30,175	.....	Open.					
ROSSALL:									
School Library.....	.....	.....	.....	.....	
RUGBY:									
School Library. <i>ante</i>	1813	5,000	Few.	Masters and Boys.					
ST. ANDREWS:									
University Library.....	1612	90,000	200	Members (o.b.l.)					
ST. HELEN'S:									
Free Library.....	1854	6,000	Few.	Open.					
	1877								
SALFORD:									
Royal Mus. and Library..	1849	70,000	150	Open.					
SALISBURY:									
Cathedral Library.....	11th cent	4,877	187	Open.					
SHEFFIELD:									
Free Library and Museum	1855	66,000	.....	Residents.					
SHREWSBURY:									
School Library.....	.....	5,000	Few.	Masters (o.b.l.)					
SMETHWICK:									
Free Library.....	1876	4,036	.....	Open.					
SOUTHAMPTON:									
Hartley Institute.....	1862	18,000	Few.	Sub.; pub. in eveng.					
SOUTHPORT:									
Atkinson Free Library...	1875	10,350	.....	By guar.					
SOUTH SHIELDS:									
Public Library.....	1871	13,250	.....	Open.					
STAFFORD:									
William Salt Library.....	1872	7,500	.....	Open.					
STOCKPORT:									
Free Public Library.....	1875	16,400	.....	Open.					
STOKE-UPON-TRENT:									
Free Library.....	1878	6,186	.....	Open.					
SUNDERLAND:									
Public Free Library.....	1862	10,000	.....	By guar.					
SWANSEA:									
Public Library.....	1874	26,500	20	Open.					
Royal Inst of South Wales	1835	13,000	Few.	Sub.					
TRURO:									
Bishop Phillpott's Library.	.....	5,000	.....	Dioc. Cler., or Sub.					
Cornwall Library.....	1792	17,000	.....	Sub.					
TYNEMOUTH:									
Free Library.....	1868	9,083	.....	By guar.					
WALSALL:									
Free Library.....	1859	10,850	.....	Open.					
WARE:									
St. Edmund's Col. Library	1794	20,000	.....	Members.					
WARRINGTON:									
Museum.....	1848	18,000	100	Sub. for lend. lib.					
WARWICK:									
Free Library.....	1866	8,000	.....	Open.					
WEDNESBURY:									
Free Library.....	1878	7,000	.....	Open.					
WEST BROMWICH:									
Free Library.....	1874	12,000	.....	Open.					
WIGAN:									
Free Public Library.....	1877	27,000	1	Open.					

III. FRANCE.

ABBEVILLE:				
Bibliothèque de la Ville...	1685	40,000	Few.	Open, book lent.
AGEN:				
Bibliothèque.....	.....	30,000	Few.	Open.
AIX:				
Bibliothèque Mejanès.....	1786	150,000	1,100	Open, books lent to prof.
	1810			
AJACCIO (Corsica):				
Bibliothèque.....	1800	30,000	200	Open, books lent by l.
AMIENS:				
B. Communale.....	1791	70,000	800	Open, books lent by l.
ANGERS:				
B. Communale.....	1791	44,000	1,500	Open.
ARRAS:				
Bibliothèque.....	.....	40,000	1,200	.....
AUCH:				
B. Communale.....	1793	15,000	.....	Open.
AUXERRE:				
Bibliothèque.....	.....	40,000	224	Open, books lent by l.
AVIGNON:				
Bibliothèque.....	1791	93,000?	1,200	.....
BEAUNE:				
B. de la Ville.....	1794	39,000	500	Open, books lent by l.
BESANCON:				
B. de la Ville.....	1694	130,000	1,800	Open, b. l.
BLOIS:				
B. Communale.....	1792	30,000	Few.	Open, books lent by l.
	1812			
BORDEAUX:				
Bibliothèque.....	18—	190,000	1,500	Open.
BOULOGNE:				
B. Communale.....	1798	50,600	90	Open.
BOURG:				
B. Communale.....	1790	30,000	60	Open, book lent.
BOURGES:				
B. Publique.....	1792	25,000	327	Open, b. l.
BREST:				
B. de l'Ecole de Médecine Navale.....	1802	15,200	.....	Med. staff.
CAEN:				
Bibliothèque.....	1809	80,000	524	Open.
CAMBRAI:				
Bibliothèque.....	1791	40,000	1,300	.....
CARPENTRAS:				
Bibliothèque.....	.....	25,000	1,000	Open.
CHALONS-SUR-MARNE:				
Bibliothèque.....	1800	30,000	80	.....
CHARTRES:				
B. Communale.....	1794	65,000	1,673	Open, b. l.
CHAUMONT:				
Bibliothèque Publique...	1790	32,000	300	Open.
CLERMONT-FERRAND:				
Bibliothèque.....	.....	40,000	400	.....
DIJON:				
B. Publique.....	1708	79,427	1,106	Open

Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
DOLE (Jura): Bibliothèque..... <i>ante</i>	1786	27,853	.....	Open.
DOUAI: B. Publique.....	1789	100,000	1,297	Open.
EPINAL: Bibliothèque.....	.....	30,000	220	.....
GRENOBLE: Bibliothèque.....	1772	170,000	7,000	Open, b. l.
HAVRE: B. Municipale.....	1790	36,121	59	Open, b. l.
LA ROCHELLE: B. de la Ville.....	1797 1804	30,646	569	Open, b. l.
LAVAL: B. Municipale.....	1822	28,000	.....	Open.
LE MANS: Bibliothèque.....	.....	80,000?	700	.....
LILLE: B. Municipale.....	1790	75,000	800	Open, b. l.
LYONS: B. de la Ville.....	1530	120,000	1,500	.....
..... B. du Palais des Arts.....	1806	65,600	46	Open.
MARSEILLES: Bibliothèque.....	1796	95,000	1,530	Open.
MONTPELLIER: B. de la Ville.....	179-	80,000	.....	Open.
..... Ecole de Medecine.....	.....	40,000	600	By leave.
NANCY: Bibliothèque.....	1790	62,221	717	Open.
NANTES: Bibliothèque.....	1588	150,800	200	Open.
NICE: B. Municipale.....	1790	46,000	Few.	Op.; bks. l.
NIMES: Bibliothèque.....	Aft.	.....	.....	.....
.....	1792	75,000	200	Open.
ORLEANS: B. Communale.....	1714	50,480	649	Op.; bks. l.
PARIS: B. de l'Arsenal.....	1790	200,000	6,000	Open.
..... B. du Corps Legisl.....	1793	50,000	.....	.....
..... B. de la Cour de Cassa- tion.....	.....	30,000	Many.	Judges (o. b. l.)
..... B. du Depot de la Guerre.....	.....	80,000	Many.	Open by l.
..... B. du Depot de la Marine.....	.....	36,000	258	Open by l.
..... B. de l'Ec. Nat. de Beaux Arts.....	1648	15,000	.....	Sudents, (o. b. l.)
..... B. de la Faculte de Mede- cine.....	1733	55,000	.....	Open.
..... B. de l'Institute.....	1759	100,000	.....	Open by l.
..... B. Mazarine.....	1643	150,000	6,000	Open.
..... B. du Museum d'Hist. Naturelle.....	.....	30,000	.....	.....
..... B. Nationale.....	1595	2,290,000	80,000	Open.
..... B. Polonaise.....	1737	50,000	.....	Open.
..... B. Ste. Genevieve.....	1838	120,000	2,392	Open.
..... B. de l'Universite (Sor- bonne).....	1624	125,000	1,000	.....
..... B. de la Ville.....	18th cent	60,000	.....	Open.
POITIERS: Bibliothèque.....	.....	30,000	420	.....
QUIMPER: Bibliothèque.....	1794	30,360	120	Op.; bks. l.
RENNES: B. de la Ville.....	1733 1803	48,289	221	Open.
RHEIMS: B. de la Ville.....	1809	60,000	1,300	Op.; bks. l.
ROUEN: B. Publique.....	1792 1809	122,500	2,500	Open; b. l.
SOISSONS: B. Publique.....	1794	30,000	300	.....
TOULOUSE: B. Publique.....	1804	70,000	.....	Open.
TOURS: Bibliothèque.....	1791	50,000	2,000	Open.
TROYES: B. Communale.....	1691	100,000	3,000	Open.
VERDUN: B. Municipale.....	.....	30,000	438	Op.; bks. l.

Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
VERSAILLES: B. Municipale.....	1799	80,000	.....	Open.

IV. GERMAN EMPIRE.				
Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
AIX-LA-CHAPPELLE: Stadt-Bibliothek.....	1556	30,000	120	Strangers, by guar.
ALTENBURG: Herzogl. Landes-B.....	1686	50,000	.....	Open.
AMBERG: Oberpfalz, Provinzial-B...	1805	31,000	200	Open.
AROLDSEN: Fürstl. Hof-Bibl.....	.....	30,000	.....	By leave.
AUGSBURG: K. Reis-u. Stadt-B.....	1537	150,000	800	Students.
BAMBERG: Königliche B.....	1611	135,000	3,200	Strangers, by guar.
BERLIN: Königliche B.....	1661	750,000?	16,000	Op. bks. l.
..... Ko. Kriegs-akad.....	1765	65,000	52	.....
..... Ko. Obergericht.....	.....	35,000	.....	.....
..... Ko. Pr. General-stabs-B.....	.....	52,000	.....	Staff and officers.
..... Ko. Statistisches Bureau..	1810	82,500	400	.....
..... Universitäts-B.....	1831	200,000	353	Stud. by guar.
BONN: Universitäts-B.....	1818	250,000	974	Non-priv. persons by guar.
BREMEN: Stadt-B.....	1660	100,000	.....	Citizens; others by guar.
BRESLAU: Ko. u. Universitäts-B....	1811	350,000	4,000	Stud.; oths. by guar.
..... Schles. Gesellsch. f. Vaterl. Cultur.....	1810	50,000	.....	Mem.; oths by guar.
..... Stadt-B.....	1865	200,000	2,400	Open.
CARLSRUHE: Gross. Hof- u. Landes-B....	.....	134,400	3,000	Open; books lent.
CASSEL: Landes-B.....	1580	165,000	1,500	Open.
COBURG: Herzogl.-B.....	Aft. 1699	50,000	350	All educat. persons.
COLOGNE: Gymnasium am Marzellen Stadt-B.....	1804 Re- est. 1880	37,500	800	Open; b. l.
.....	.....	36,000	500	Open; b. l.
COLMAR: Stadt-B.....	1791	75,331	.....	Open.
CONSTANCE: Wessenberg'sche Stadt-B.	1800	40,000	.....	Open.
DANTZIG: Stadt-B.....	1580	83,000	Many	Open.
DARMSTADT: Grossh. Hof-B.....	1817	500,000	3,000	Op.; bks. l.
DESSAU: Herzogl. B.....	1820	70,000	Some.	.....
DETMOLD: Fürstl. Landes-B.....	1824	50,000	100	All educat. persons.
DILLINGEN: K. Kreis-u. Studien-B....	1554	75,000	200	Open by guarant.
DONAUESCHINGEN: Fürstl. Hof-B.....	1752	90,000	1,000	Open.
DRESDEN: Ko. Oeffentliche B.....	End 16th cent	350,000	6,500	Open; b. l.
..... Prinzl. Secundogenitur-B.	1767	50,000	300	By introd.
DUSSELDORF: Ko. Landes-B.....	1770	35,000	400	Op.; bks. l.
ERFURT: Königl. B.....	1400	60,000	1,000	Open.

Name.	Founded.	No. of Vols.		To whom Accessible.	Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.				Print.	MSS.	
ERLANGEN: Universitäts-B....	1743	147,000	1,900	Op.; bks. l.	PADERBORN: Theodorianische B.....	1618	30,000	Some	Teachers and Stud.
FRANKFORT: Senckenbergische B.....	1763	40,000	.....	Open.	PASSAU: Ko. Kreis-u. Studien-B...	1612	33,276	121	Op. to Stud.
Stadt-B.....	1840	150,000	300	Op.; bks. l.	RATISBON: Fürstl. Thurn-u. Taxische B.....	1775	40,000	.....	Op. by leave
FREIBURG IN BREISGAU: Universitäts-B.....	1484	270,000	500	Open.	Ko. Kreis-B.....	1430	35,253	.....	Open.
GEISSEN: Universitäts-B.....	1612	160,000	1,370	Open.	ROSTOCK: Universitäts-B.....	1430	140,000	800	Open by guarant.
GOtha: Herzogliche B.....	1647	245,000	6,000	Open.	RUDOLSTADT: Oeff. B.....	1419	63,000	Few	.....
GOTTINGEN: Ko. Universitäts-B.....	1737	400,000	4,800	Open by guarant.	SCHWEIDNITZ: Grafl. v. Hochbergsche B.	17—	40,000	1,300	Open.
GREIFSWALD: Ko. Universitäts-B.....	1456	120,000	812	Open.	SCHWERIN: Regierungs-B.....	17—	30,000	.....	Open.
HALLE (Wittenberg): Universitäts-B.....	1699	220,000	Few.	.....	STRALSUND: Raths-B.....	1709	60,000	400	Open.
HAMBURG: Commerz-B.....	1735	70,000	.....	Op.; bks. l.	STRASBURG: Kath. Seminar.....	.....	30,000	.....	.....
Stadt-B.....	1610	350,000	5,500	.....	Stadt-B.....	1872	50,000	250	Open.
HANOVER: Konigl. Oeffentl. B.....	1649	170,000	4,000	Books lent by guar.	Universitäts-u. Landes-B.	1871	513,000	.....	Open.
Societats-B.....	1789	45,000	.....	Members.	STUTTGART: Centralstelle für Gewerbe u. Handel.....	.....	50,000	.....	Open; b. l.
Stadt-B.....	15th cent	30,000	250	Open.	K. Oeffentl. B.....	1765	425,000	3,800	Open.
HEIDELBERG: Universitäts-B.....	1386	300,000	4,700	Op.; bks. l.	TREVES: Stadt-B.....	1815	80,000	2,300	Open.
HILDESHEIM: Beverinsche B.....	1673	33,000	88	Open.	TUBINGEN: Ko. Universitäts-B.....	1547	235,000	3,300	Mem. (o.b.l.)
JENA: Universitäts-B.....	1502	180,000	.....	Op.; bks. l.	ULM: Stadt-B.....	1443	49,624	Incl. works.	Open.
KIEL: Universitäts-B.....	1665	180,000	2,000	Op.; bks. l.	WARMBRUNN: V. Schaffgotsch Freistandesherrl. B.....	1576	50,000	Some	Open.
KONIGSBERG: Konigl. und Universitäts-B.....	1534	184,000	.....	Stud.; oths. by guarant.	WEIMAR: Grossherzogliche B.....	17th cent	180,000	2,000	Open; bks. l.
KORNIK (Posen): B. Kornicka,	1825	50,000	1,200	Open by leave.	WERNIGERODE: Stolberg-W. B.....	1370	87,163	1,100	Op. by int.
LEIPZIG: Stadt-B.....	1677	100,000	1,500	Op.; bks. l.	WIESBADEN: Ko. Landes-B.....	1814	Over 100,000	.....	Open.
Universitäts-B.....	1409	500,000	4,000	Members.	WOLFENBUTTEL: Herzogliche B.....	Bef. 1589	300,000	9,000	Open.
LUBECK: Stadt-B.....	1620	100,000	250	Open; books l.	WURZBURG: Universitäts-B.....	1582	300,000	2,000	Op.; bks. l.
LUNEBERG: Stadt-B.....	1555	32,000	350	Open.	V. AUSTRIA-HUNGARY.				
LUXEMBURG: Bibliothèque.....	1798	80,000	.....	Students.	ADMONT: B. der. Abtei.....	1074	80,000	966	Students.
MAIHINGEN: Oettingen-Wallersteinsche B.....	1812	100,000	1,507	Books lent.	BRUNN: Franzens Mus.-B.....	1818	31,000	1,176	Students.
MAINZ: Stadt-B.....	1477	150,000	1,200	Open; books lent.	BUDA-PEST: Szechenyi'sche Landes-B	1802	400,000	63,000	Open.
MANNHEIM: Oeffentliche B.....	1870	40,000	.....	Open.	Ungar. Akad. d. Wissenschaften.....	1826	90,000	.....	Mem. (o.b.l.)
MARBURG: Universitäts-B.....	1558	140,000	109	Mem. of un.	Universitäts-B.....	1635	186,000	1,000	Open; books lent.
MEININGEN: Herzogl. Oeff. B.....	1680	160,000	.....	Books lent.	CRACOW: Universitäts-B.....	1364	201,831	4,781	Open.
METTEN: Benediktiner Kloster-B...	1830	60,000	250	Mem. (o.b.l.)	GOTTWEIH: Benediktiner-Stifts-B.....	11th cent	43,387	1,100	Members.
MIETZ: B. Municipale.....	1811	60,000	1,084	Open; books lent.	GRAZ: Landesreg.-B.....	1811	68,594	.....	.....
MUNICH: Benedikt. Stift. S. Bonifaz.	1850	30,000	150	Open to scholars.	Universitäts-B.....	1776	120,000	2,005	Op.; bks. l.
Ko. Hof-u. Staats-B.....	16th cent	1,000,000	26,000	Open.	HERMANNSTADT: National-B.....	.....	60,000	700	.....
Universitäts-B.....	1472	322,800	1,744	Mem. (o.b.l.)	HOHENFURTH: Cisterc. Stifts-B.....	1756	39,010	600	Open by v.
MUNSTER: Ko. Paulinische B.....	1588	123,175	808	Stud. etc. (o. b. l.)	INNSBRUCK: Universitäts-B.....	1745	92,000	1,027	Op.; bks. l.
NUREMBERG: Germanisches Nat. Mus..	1852	90,000	.....	Books lent.	KLAGENFURT: Studien-B.....	1563	40,000	250	Open
Stadt-B.....	1445	50,000	1,012	Op.; bks. l.		1784			
OLDENBURG: Grossherzog. Oeff. B.....	1792	100,000	.....	Open					

Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
KLOSTERNEUBURG: Chorherren-Stifts-B.....	1107	55,000	1,400	.....
KONIGSWART: F. Metternich-Winneberg- sche B.....	.....	35,000	.....	Open.
KREMSMUNSTER: Benedikt.-Stifts-B.....	1012	50,000	1,800	Mem. (o.b.l.)
LAIBACH: Studien-B.....	1791	47,423	419	Op. to Stud.
LEMBERG: Ossolinski'sches National- Institut.....	1817	78,000	2,897	Open.
Universitäts-B.....	1784	80,000	.....	Open.
LINZ: Oeff. Studien-B.....	1774	33,000	200	Open.
MAROS-VASARHELY: Oeff. Teleki'sche B.....	1812	90,000	.....	.....
MARTINSBERG: Benediktiner Erzabtei.....	.....	98,000	800	Members.
MELK: Bened.-Stifts-B.....	1189	60,000	1,000	Private.
OLMUTZ: Oeff. Studien-B.....	1774	62,000	1,000	Open.
OSSEGG: Cister.-Stifts-B.....	1725	30,000	100	By leave.
PRAGUE: F. v. Kinky'sche B.....	.....	40,000	.....	Open.
F. Lobkowitz. B.....	.....	30,000	600	Books lent.
K. K. u. Universitäts-B.....	1366	74,122	3,818	Open.
Pramonstrat.-Stift am Stra- how.....	1777	.....	.....	.....
Vaterl. Museum.....	1818	60,000	500	.....
PRESSBURG: Appony'sche B.....	.....	125,000	3,000	Open.
Ungar. Gelehrte Gesell- schaft.....	1844	60,000	.....	Members.
RAUDNITZ: Fursl. Lobkowitz'sche B.....	1510	51,410	600	.....
ST. FLORIAN: Chorherren-Stift B.....	11th cent	63,545	869	Members.
SALZBURG: Benedikt.-Stift St. Peter..	6th cent	65,000	900	Mem. (o.b.l.)
Landes-u. Studien-B....	1617	82,000	1,400	Open.
SEITENSTETTEN: Benedikt.-Stifts-B.....	.....	35,000	.....	Members.
TEPL: Chorherren-Stifts-B.....	1197	42,075	189	Members.
TRENT: B. Civica.....	1841	40,500	1,548	Open.
TRIESTE: Stadt-B.....	1795	30,000	.....	Open.
TROPAU: Museums-B.....	1814	35,249	.....	Open.
VIENNA: Benediktin.-Stift Schotten.	1158	60,000	600	By leave of the Abbot.
Erzherogl. Albrecht'sche B.	1795	40,000	.....	Open.
F. Esterhazy-B.....	1791	40,000	.....	.....
Fursl. Liechtenstein'sc. B.	1780	50,000	.....	O. b. l.
K. K. Familien-u. Privat-B.	1792	80,000	.....	By spl. leave
K. K. Finanzminis.....	.....	35,000	250	Op.; bks. l.
K. K. Kriegsministerium.	1801	40,000	.....	Officers (o. b. l.)
K. K. Ministerium des Innern.....	1849	50,000	.....	Easily accessible.
K. K. Obergymnasium der Theresianischen Akad.....	1726	38,000	130	Open to strangers; books lent
K. K. Oeffentl. B.....	1495	440,000	20,000	Op.; bks. l.
K. K. Technische Hochschule.....	1816	40,000	.....	Open.
K. K. Universitäts-B.....	1777	271,970	190	Op.; bks l.
K. K. Zoologisches Cabinet.....	1770	30,000	Few.	Books lent.
Mechitaristen-B.....	1773	38,243	78	Members.
WEISKIRCHEN: Militar-Schulen-B.....	1869	46,000	.....	Staff & Off.

VI. SWITZERLAND.				
Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
AARGAU: Aargauische Kantons-Bib- liothek.....	1803	60,000	1,200	Open.
BASEL: Allg. LeseGesellschaft.....	1787	40,000	.....	Subscribers.
Oeffentl. B. (Univ.).....	1460	120,000	4,000	Op.; bks. l.
BERN: LeseGesellschaft.....	1791	42,000	.....	Subscribers.
Stadt-B.....	1528	50,000	3,000	Subscribers.
EINSIEDELN: Stifts-B.....	946	40,000	1,200	Members. (o. b. l.)
FRAUENFELD: Thurgauische Kantons-B.....	1807	35,000	.....	By buying catalogue.
GREIBURG: Cantonale B.....	1848	38,000	.....	Open.
GENEVE: B. Publique.....	16th cent	110,000	1,800	Open.
LAUSANNE: B. Cantonale.....	1536	62,000	.....	Op.; bks. l.
LUCERNE: Cantons-B.....	1832	83,000	.....	Op.; bks. l.
NEUCHÂTEL: B. de la Ville.....	1793	80,000	.....	Op.; by gu
ST. GALL: Stadt-B.....	1536	60,400	500	Open.
Stift-S-B.....	830	41,700	1,800	Adults.
SCHAFFHAUSEN: Stadt-B.....	1636	30,000	450	Small sub.
SOLOTHURN: Stadt-B.....	1761	37,500	200	Open.
ZURICH: Kantonale Lebranstalten.....	1835	55,000	800	Open.
Stadt-B.....	1629	97,000	3,000	Small sub.

VII. ITALY.				
Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
BOLOGNA: Biblioteca della Universita	1712	160,000	6,000	Open; stud. only in winter evenings.
B. Comunale.....	1801	.....	.....	.....
CAGLIARI: B. Universitaria.....	1839	120,000	.....	Open.
CATANIA: B. dell' University.....	1793	30,000	MSS.	Open.
B. Ventimiliana.....	1755	42,000	.....	Open.
CAVA DEI TIRRENI: B. della SS. Trinita.....	1783	20,000	.....	Open.
CREMONA: B. Governativa.....	11th cent	10,000	.....	Open.
FERRARA: B. Comunale.....	1774	40,000	.....	Open.
FLORENCE: B. Marcelliana.....	1753	100,000	Incl.	Open.
B. Nazionale.....	1752	136,500	3,000	Open.
B. della R. Acca. della Arte.....	1714	400,000	15,000	Open. (over 18).
B. Riccardiana.....	1891	.....	.....	.....
Libreria Medi-Laurenziana.....	1801	15,000	.....	Open to Students
GENOA: B. Della Cong. della Mis- sione Urbana.....	1815	28,000	3,500	Open.
B. Franzoniana.....	15th cent	3,000	7,000	Open.
B. della Universita.....	1727	50,000	300	Open.
LUCCA: B. Pubblica.....	1778	16,000	32	.....
MACERATA: B. Comunale Mozzi Bor- getti.....	1773	116,492	1,363	Open (over 18); Stud
.....	1855	50,000	1,268	Open.
.....	.....	50,000	680	Open.

Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
MANTUA:				
B. Governativa.....		30,000	.....	Open.
MESSINA:				
B. dell' Università degli Studi.....	1783	40,000	700	Open (over 18).
MILAN:				
B. Ambrosiana.....	1609	164,000	8,100	Open.
B. Nazionale de Brera....	1770	102,123	3,046	Open. (over 18).
MODENA:				
B. Estense.....	1598	90,000	3,000	Open.
B. Universitaria.....	1844	20,000	.....	Open.
MONTI CASSINO:				
B. del. Menast.....	10th cent	40,000	1,000	By leave.
			30,000	chrt.
NAPLES:				
B. Brancacciana.....	1673	150,000	3,000	Open.
B. dei Girolamini.....	1690	30,000	.....	Open.
B. Nazionale.....	1804			
	1863	275,000	8,000	Open. (over 18).
B. di S. Giacomo.....	1863	35,000	.....	Open. (over 18).
B. dell' Oratorio.....	16th cent	26,420	355	Open.
B. dell' Università.....	1812			
	1827	150,000	25	Open.
NOVARA:				
B. Civica.....	1847	30,000	.....	Open.
PADUA:				
B. Universitaria.....	1629	158,240	2,458	Open. (over 18).
PALERMO:				
B. Comunale.....	1775	140,941	2,640	Open.
B. Nazionale.....	1804	110,000	12,000	Open.
PARMA:				
Regia B.....	1779	213,995	Incl.	Op. (over 18)
PAVIA:				
B. dell' Università.....	1772	185,000	791	Op. (over 18)
PERUGIA:				
B. Civica.....	1852	30,000	915	Open.
PISA:				
B. della R. Università....	1742	120,000	.....	Op. (over 15)
RAVENNA:				
B. Classense.....	1710	65,000	1,200	Open.
			7,000	deeds
RIMINI:				
B. Gambalunga.....	1619	36,000	Incl.	Open.
ROME:				
B. della R. Accademia dei Lincei.....	1867	12,500	.....	Members.
B. Alessandrina dell' Università (or B. della Sapienza).....	1667	80,000	235	Open (over 18).
A. Angelica.....	1605	65,696	2,453	Students.
B. Barberina.....	.....	70,000	7,000	By leave.
B. della Camera dei Deputati.....	1848	34,000	.....	Deputies.
B. Casanatense.....	1871			
	1700	130,000	2,500	Open (over 18).
B. Chigiana.....	1660	30,000	3,036	Leave of Pr. Chigi.
B. Corsini.....	.....	60,000	1,300	By leave.
B. della Propag.....	1626	47,000	3,000	Members.
B. del Senaen.....	1872	25,000	.....	Senators.
B. Vaticana.....	5th cent	220,000	25,600	By leave.
B. Vit. Emanuele.....	1455	360,000	5,000	Open.
SASSARI:				
B. Universitaria.....	1556	25,000	.....	Open.
SIENA:				
B. Comunale.....	1757	55,750	4,250	Open.
SUBIACO:				
Monastero di S. Scolastica	1350	6,000	400	Open.
TURIN:				
B. dell' Università.....	1753	240,000	3,300	Open.
B. Nazionale.....	1720	170,000	Incl.	Open. (over 18).
URBINO:				
B. dell' Università.....	1826	10,000	6	Open.
VENICE:				
B. Marciana.....	1362	260,000	9,036	Open (over 18)
Museo Civico.....	1468	.....	.....	.....
VERCELLI:				
B. Agnesiana.....	1746	35,000	40	Open.
VERONA:				
B. ed Archivi Comunali....	1792	124,303	.....	Open (over 18)
B. Capitolare.....	1723	20,000	1,080	Open.
VICENZA:				
B. Bertoliana Comunale....	1706			
	1710	105,000	2,000	Open.

VIII. BELGIUM.

ANTWERP:				
B. Publique de la Ville....	1609	42,213	.....	Open (over 16).
BRUGES:				
B. Publique de la Ville....	1798	100,000	MSS.	Open.
BRUSSELS:				
B. Royale.....	1837	350,000	30,000	Open.
GHENT:				
B. de l'Université.....	1797	250,000	1,600	Open (over 18)
LIEGE:				
B. de l'Université.....	1817	105,746	1,544	Open (over 17)
LOUVAIN:				
B. de l'Université.....	1636	250,000	.....	Open.
MAESTRICHT:				
B. de la Ville.....	1662	12,000	.....	Open.
MONS:				
B. Communale.....	1802	30,000	393	Open.
NAMUR:				
B. de la Ville.....	1797	20,000	100	Open.
TOURNAI:				
B. Publique.....	1755	40,000	275	Open.

IX. HOLLAND.

AMSTERDAM:				
Universite Bibliotheek....	15th cent	100,000	500	Open.
HAARLEM:				
B. Communale.....	1596	25,000	150	Open.
HAGUE (THE):				
De Koninklijke Bibliotheek	1798	200,000	4,000	Open (over 14)
LEYDEN:				
Bibliotheek Academy.....	1575	160,000	4,950	Open.
ROTTERDAM:				
Bibl. der Stad.....	1870	40,000	Few.	Open.
UTRECHT:				
Universite Bibliotheek....	1582	150,000	950	Open.

X. DENMARK.

COPENHAGEN:				
Athenæum.....	.....	50,000	.....	Members.
Det Store Kongelige Bibliothek.....	1670	482,000	18,000	Open by voucher
Kongens Haandbibliothek	18—	40,000	.....	King's per.
Universitetsbibliothek....	1482			
	1728	250,000	4,000	Open.

XI. ICELAND.

REYKJAVIK:				
College Library.....	.....	9,000	.....	Members.
Stiptisbokaafn.....	.....	30,000	.....	Open.

XII. NORWAY.

Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
CHRISTIANIA:				
Deichmannske Bibliothek.	1780	15,200	300	By voucher.
Universitetsbibliothek.	1811	230,000	1,170	By voucher.
THRONDHJEM:				
K. norske Videnskab. Selskab. B.	1767	50,000	1,000	Residents.

XIII. SWEDEN.

LUND:				
Universitetsbibliothek.	1688	120,000	3,000	Members (o. b. l.)
STOCKHOLM:				
Kongliga or Riks B.	1585	250,000	8,000	Open.
UPSALA:				
Universitetsbib.	1620	220,000	10,000	Open.

XIV. SPAIN.

BARCELONA:				
Archivo de la Corona de Aragon.		50,000	MSS.	By leave.
Museo y Biblioteca Provincial.		50,000	MSS.	By leave.
CADIZ:				
B. Provincial.		30,000		Open.
ESCORIAL:				
Biblioteca.	1575	32,143	4,611	By leave.
MADRID:				
B. Nacional.	1711	400,000	10,000	Open.
B. del Palacio Real.		100,000		By leave.
B. de San Isidro.		65,000		Open.
B. de la Universidad.		30,000		Open.
SALAMANCA:				
B. de la Universidad.	1254	70,514	870	Open.
SANTIAGO:				
B. Publica University. Provincial.	1532	37,000	271	Open.
SEVILLE:				
B. Columbina.	1560	18,000	MSS.	Open.
B. Universitaria.	1767	60,000		Open.
TOLEDO:				
B. de la Catedral.	1598	30,000	100	By leave.
VALENCIA:				
B. del Arzobispado.		10,500	MSS.	Open.
B. Universitaria.	1785	42,000		
VALLADOLID:				
B. de la Universidad.	1480	27,180	308	Open.

XV. PORTUGAL.

COIMBRA:				
B. da Universidade.	1591	84,000		Mem. (o. b. l.)
EVORA:				
B. Archiepiscopal.		30,500	MSS.	By leave.
LISBON:				
B. da Academia.	1780	60,000	MSS.	Open.
B. Nacional.	1796	200,000	9,415	Open.
MAFRA:				
Bibliotheca.	1730	30,000		By leave.
PORTO:				
Book Publishers' Municpl.	1833	100,000	1,300	Open.

XVI. GREECE.

ATHENS:				
University Library.	1837	150,000	600	Open.
CORFU:				
Public Library.	1800	40,000		Open.

XVII. RUSSIA.

Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
DORPAT:				
University Library.	1801	143,500	730	Mem.
HELSINGFORS:				
University Library.	1828	140,000		Residents.
KAZAN:				
University Library.	1804	80,000		Mem.
KHARKOFF:				
University Library.	1805	56,000		Mem.
KIEFF:				
University Library.	1833	110,000		Mem.
MOSCOW:				
Golitzin Museum.	1865	20,000	30	Open.
Public Museum.	1861	300,000	5,000	Open.
Library of the Patriarchs.	1650		1,500	By leave.
University Library.	1755	170,000		By leave.
ODESSA:				
Public Library.	1830	40,000		Open. (over 12).
ST. PETERSBURG:				
Academy of Science.	1726	150,000	MSS.	By leave.
Hermitage Library.				
Imperial Public Library.		1,000,000	26,000	Open. (over 12).
Monastery of St. Alexander Nevsk.		10,000	MSS.	
University Library.	1824	138,677		Mem. (o. b. l.)

XVIII. EGYPT.

CAIRO:				
Public Library.	1860	40,000	Incl.	Open.

XIX. INDIA, CHINA AND JAPAN.

BENARES:				
College Library.	1805	10,000	2,500	Mem.
BOMBAY:				
Royal Association Society.	1804	40,000	250	Mem.
CALCUTTA:				
Calcutta Public Library.	1836	45,000	Few.	Sub.
Geol. Survey.	1856	10,000		Open.
Indian Museum.	1866	6,000		By leave.
Royal Association Society, Bengal.	1784	15,000	9,400	Mem.
St. Paul's Cathedral.	1858	11,300		By leave.
Sanskrit College.	1824	4,800	2,769	Mem. (o. b. l.)
MADRAS:				
Free Public Library.	1855	10,000		Open.
Literary Society.	1866	26,000		Mem. and Subscribers.
ROORKEE:				
Thomason College.	1856	14,000		Members.
TANJUR:				
Library of Raja.	beg. 17th cent.	18,000		By leave.
SHANGHAI:				
N. China Br. of R. As. Soc.	1857	2,500	1,100	Members.
Raffles Library.	1844	11,000		Open.
BATAVIA:				
Batav. Genootschap.		20,000	1,630	Open.
TOKIO:				
Library of Tokio Fu.	1873	68,000	Incl.	Open.

XX. BRITISH COLONIES.

Australia.				
SYDNEY:				
Free Pub. Lib. (1 branch).	1869	51,163		Open. (over 12).
Parliamentary Library.	1844	27,000		Members.
BRISBANE:				
Free Public Library.				
ADELAIDE:				
S. Australia Institute.	1836	30,000		Open; books lent on payt.

Name.	Founded.	No. of Vols.		To whom Accessible.
		Print.	MSS.	
MELBOURNE: Public Library of Victoria	1853	111,644	10	Open. (over 14).
British Guiana.				
GEORGETOWN: Royal Agr. and Com. Soc. Library	1844 1864	25,000	.....	Members.
Canada.				
OTTAWA: Library of Parliament	1815	100,000	50	Mem. (o.b.l.)
QUEBEC: Bibl. de la Legislature	1867	30,000	.....	Mem. (o.b.l.)
TORONTO: Mechanics' Institute	1831	10,043	.....	Members.
University Library	1858	24,000	3	Members.
Jamaica.				
KINGSTON: Free Pub.Lib. (3 br'nch's)	1874	.....	.....	Open.

LIBRATION (from Lat. *libra*, "a balance," meaning an oscillating motion), a term denoting certain movements of the moon, chiefly *apparent*, which have an important effect on the apparent position of the lunar formations. A short study of these reveals puzzling changes in their place from night to night. Those near the edge of the disc disappear and reappear in a seemingly irregular way, while central formations approach or leave the center in relation with this motion. These appearances are due to an apparent motion of the moon by which its globe seems to turn slightly round to each side alternately, so that we see a little farther round her globe on all sides in turn than we would do if she kept absolutely the same face toward us. This motion, as it refers to the north and south edges of the moon's disc, is called *libration in latitude*; as it refers to the east and west edges, it is called *libration in longitude*. The libration in latitude arises from the inclination of both the lunar equator and orbit to the ecliptic. From the relation between these two factors their effects always reinforce each other, so that when the moon rises above the ecliptic in her orbit she also inclines her under side to us, and when below the ecliptic, her upper side. The libration in longitude arises from the unequal speed of the moon in her orbit (see MOON) combined with her sensibly uniform rotation. She is thus sometimes before or behind her mean place, and we can see a little round her west or east edge respectively. An observer at the north or south pole of the earth will also from his position see a little round the north or south edge of the moon's disc, and for intermediate positions the effect has intermediate values. In the same way an observer in the tropics will see farther round the west or east edges of the moon, as he is carried from west to east by the earth's rotation. These effects are known as the *diurnal* or *parallactic* libration. The maximum libration in longitude is nearly $6^{\circ} 50'$. That in latitude equals $7^{\circ} 53'$. The diurnal libration may rise to $1^{\circ} 2'$. These numbers refer to the apparent displacement of lunar markings in lunar latitude and longitude.

LIBRETTO (Ital. "little book"), the book of an opera. In too many cases it is deplorable, from the absence of any literary quality, plot, or consistency; and this largely because, almost from the beginning, any poetic or dramatic powers were forced into the Procrustes' bed formed by the requirements of the musician's art. The Italian librettos are especially poor, but many of their English and German rivals run them

hard in this respect. Among the most noteworthy librettists have been Metastasio, Calzabigi, and Felice Romano in Italy; Quinault, Marmontel, Scribe, Barbier, Meilhac, and Halévy, as well as Sardou, in France; the poet Geibel (who wrote *Loreley* for Mendelssohn) and Schikaneder (who wrote the *Zauberflöte*, etc., for Mozart) in Germany; and Gay, Alfred Bunn, Edward Fitzball, Theodore Hook, Planché, and Gilbert in England. Wagner stands alone, in that, after the *Flying Dutchman*, he himself wrote the librettos of his great music-dramas, becoming, to use his own words, "first of all a poet." Dryden, Addison, Fielding, Chatterton, "Monk" Lewis, Voltaire, and Rousseau, besides Sheridan, Dickens, and Mark Lemon, have attempted libretto-writing; while numerous subjects for operas have been taken from the works of Shakespeare, Goldsmith, Goethe, Scott, Hugo, etc.

LIBURNIANS were a people who at different times were prominent on the Adriatic coasts. They were originally, one cannot doubt, one of the homogeneous Illyrian tribes (see ILLYRIA). Living in a barren rocky country along the northeastern coast of the Adriatic, they devoted themselves to the sea, and were the chief navigators of the Adriatic in the early period. They settled on the coast of Picenum, where the town of Truentum was always counted Liburnian; and the Greek colonists found them at Corcyra and other places.

LIBYA was a geographical name by which the Greeks usually designated Africa, with the exception of Egypt, although, sometimes, the continent was thought to be divided between Libya and Ethiopia.

LICATA. See ALICATA.

LICHENS (*Lichenes*) may briefly be defined as cellular perennial plants, furnished with a vegetative system containing gonidia, and with a reproductive system consisting of female thecasporous fruits and male spermogonous organs. They constitute a distinct class of cellular cryptogams, intermediate between algæ and fungi, to both of which, in some respects, they present certain affinities. By the earlier authors they were regarded as being *Aerophyca* or terrestrial algæ, while of recent years they have been viewed by some writers as being *Ascomycetous* fungi. From both of these, however, they are sufficiently distinguished and separated by the special structure of their thallus, by the presence of certain immediate principles proper to their tissues, and by their mode of life and nutrition.

Lichens derive their nourishment directly from the atmosphere, in the shape of rain (or dew) with the materials contained in it. Here, as elsewhere, water is the condition of life, and through its medium is conveyed to them the nutrient substances requisite for their existence and growth, from the clouds, from rivers, and, in the case of maritime species, even from the sea. Where, however, the atmosphere is impregnated with smoke, soot, or other deleterious ingredients, lichens will not grow nor flourish. Hence in our larger cities, or even in smaller manufacturing towns, scarcely any lichen vegetation, or none whatever, is seen. Even in their more immediate suburban districts they occur only in a gonidial or rudimentary state, constituting the pseudogenus *Lepraria* of the older botanists, and increasing through long periods by bisection, but never developing into perfect plants. Indeed it is now a well-known fact that their fully developed condition is a sure indication of the purity of the air and the salubrity of the districts in which they occur. It has sometimes been stated that they draw some portion at least of their nutriment from the substratum to which they are affixed. For this, however, their structure is by no means well adapted, and such inorganic substances as iron and lime, which

enter into their composition, are only as if mechanically derived in solution from the substratum. This in very many instances, *e.g.*, bare quartzose rocks, dead sapless wood, and pure naked glass, can evidently supply no nutriment whatever. Moreover, in the case of crustaceous species, such as *Lecanora tartarea*, etc., and also of terricole fruticulose species, such as *Cetraria islandica*, etc., the portion of the thallus next to the substratum is dead, so that no nutrient substances can be conveyed through it to the upper layers of the thallus. A very simple, but at the same time convincing, illustration of this is adduced by Nylander. "By immersing," he says, "any fruticulose thallus, such as *Usnea*, by the base in water, it remains entirely dry (with the exception of the part submersed), but if water be poured over the other portions, it quickly absorbs it, softens, and revives." The same thing may be seen in nature itself, in the case of such species as *Cladina rangiferina*, *Alectoria ochroleuca*, *Platysma nivale*, etc., growing on temporarily wet substrata, when the base of their thalli is soft and moist, and all the rest dry and rigid. It cannot therefore be doubted that the nutritive elements contained in the rain or other water are conveyed to the lichen through the surface of the thallus. It is in the superficial parts also, as Nylander has well observed (in *Flora*, 1874, No. 4), that "the active life has its seat, chiefly around the gonidia, manifesting itself in the putting forth of young parts (lobes, lacinae, branches, isidia), and in the functions of the apothecia and the spermogones, so that the nourishing humors necessary for all the actions of life are especially and directly poured upon these." The vital activities, however, in lichens thus nourished are, as might be expected from the nature of the source whence their nutriment is derived, very intermittent, and in dry weather cease to operate, and become entirely dormant. Hence their life, unlike that of all other plants, is twofold, *viz.*, one *active*, in which when moistened all the vegetative and reproductive functions are at work, and the other *passive*, in which when dry these functions are completely in abeyance. For such a peculiar duplex existence, at one time vegetating, at another lethargic, their organization in all its parts, gonidial and otherwise, is admirably adapted. More especially is this the case with respect to the lichenine found in their textures, which, being readily dried and as readily moistened, enables them to resist with impunity the greatest extremes of temperature, alternate periods of drought and wet, the scorching heat of the sun, the vehemence of stormy winds, and the nipping frosts of winter.

In this fitful and abnormal life of lichens we have the explanation in a great measure of their almost indefinite duration of existence. It is well known that they are perennial plants in the widest sense of the term, and that, though in the earlier stages of their existence their growth is comparatively rapid, yet this becomes extremely slow when they arrive at a certain age. The time required for the development of even the most rapidly growing species may be calculated by the appearance of such of these as are met with on gravestones, mortar of houses, stone walls, wooden palings and such like, the date of whose erection is known. Among other instances which have come under the present writer's own observation may be adduced the case of *Physcia parietina*, growing in fair quantity on the stones of a granite wall built in 1836 in a maritime district where the plant is extremely abundant, and where atmospheric and other conditions are well suited for its growth. In a recent visit to the spot it was found that, although the thallus is now well developed, no fructification whatever is visible, though traces of spermogones are beginning to appear, so that in the space of fifty-four years

this plant has not yet attained full maturity. But slow as is the growth of lichens after a certain stage of their development, their tenacity of life is very remarkable, as might *a priori* be inferred from their capacity of enduring without injury the greatest extremes of temperature and of hygrometrical conditions. It is on record that, after the lapse of nearly half a century, the same specimen on the same spot of the same tree has been observed without any change in its condition. On this point also E. Fries (in *L. E.*, p. xlv.) notices that certain species such as *Physcia ciliaris*, kept in houses for upward of a year, revive when again exposed to the influences of the atmosphere—an observation which in the case of *Cladina rangiferina* similarly kept for a still longer period the present writer can fully corroborate. Endowed then with this singular intermittent vitality, we can easily understand how many individuals which occur on hard mountainous rocks or on the trunks of aged trees in ancient forests are in all probability many hundreds of years old. Nor does age seem in any way to weaken their fecundity, even when the thallus has apparently ceased to grow. This as observed by Nylander (in *Syn.*, p. 5) is shown from the circumstance that were it otherwise "the already old fruits would be destitute of spores, which is never the case," unless in plants of some lower tribes, *e.g.*, *Graphidei* and *Verucariae*, in which the thallus is but sparingly gonidiose, and the life consequently is shorter. In other instances the central portion of the thallus sometimes normally perishes in old plants, as in *Pterygium centrifugum*, *Collema melinum*, *Parmelia centrifuga*, and *P. saxatilis*, leaving only peripheral circles, in which however, the life of the individual still continues for ages. In fact, "the life of lichens bears in itself no cause of death, and is only to be ended by external injuries" (E. Fries, *L. E.*, *loc. cit.*), or by the alteration of climatic and atmospheric conditions. Hence the assumption is not unwarrantable that individuals of such confessedly long-lived species as *Lecidea geographica*, growing on rocks upon the summits of lofty mountains, date from more than "fabulous epochs," and probably outrival in longevity the ages assigned to the oldest trees on the surface of the globe.

Lichens Used in the Arts.—Of these the most important are such as yield, by maceration in ammonia, the valuable dyes known in commerce as archil, cudbear, and litmus. These, however, may with propriety be regarded as but different names for the same pigmentary substance, the variations in the character of which are attributable to the different modes in which the pigments are manufactured. Archil proper is derived from several species of *Roccella* (*e.g.*, *R. Montaguei*, *R. tinctoria*), which yield a rich purple dye, and fetch a high price in the market. Of considerable value is the "perelle" prepared from *Lecanora parella*, and much used in the preparation of a red or crimson dye. Inferior to this is "cudbear," derived from *Lecanora tartarea*, which was formerly very extensively employed by the peasantry of north Europe for giving a scarlet or purple color to woollen cloths. By adding certain alkalies to the other ingredients used in the preparation of these pigments, the color becomes indigo blue, in which case it is the litmus of the Dutch manufacturers. Among other lichens affording red, purple, or brown dyes, may be mentioned *Ramalina scopulorum*, *Parmelia saxatilis* and *P. omphalodes*, *Umbilicaria pustulata* and several species of *Gyrophora*, *Urcularia scruposa*, all of which are more or less employed as domestic dyes. Yellow dyes, again, are derived from *Chlorea vulpina*, *Platysma juniperinum*, *Parmelia caperata* and *P. conspersa*, *Physcia flavicans*, *Ph. parietina*, and *Ph. lychnea*, though like the preceding they do not form

articles of commerce, being merely used locally by the natives of the regions in which they occur most plentifully. In addition to these, many exotic lichens, belonging especially to *Parmelia* and *Sticta* (e.g., *Parmelia tinctorum*, *Sticta argyrea*), are rich in colorific matter, and, if obtained in sufficient quantity, would yield a dye in every way equal to archil. These pigments primarily depend upon special acids contained in the thalli of lichens, and their presence may readily be detected by means of the reagents already noticed. In the process of manufacture, however, they undergo various changes, of which the chemistry is still but little understood. At one time, also, some species were used in the arts for supplying a gum as a substitute for gum arabic. These were chiefly *Ramalina fraxinea*, *Evernia prunastri*, and *Parmelia physodes*, all of which contain a considerable portion of gummy matter (of a much inferior quality, however, to gum arabic), and were employed in the process of calico printing, and in the making of parchment and cardboard. In the seventeenth century some filamentose and fruticulose lichens, viz., species of *Usnea* and *Ramalina*, also *Evernia furfuracea* and *Cladina rangiferina*, were used in the art of perfumery. From their supposed aptitude to imbibe and retain odors, their powder was the basis of various perfumes, such as the celebrated "Poudre de Cypre" of the hairdressers, but their employment in this respect has long since been abandoned.

Nutritive Lichens.—Of still greater importance is the capacity of many species for supplying food for man and beast. This results from their containing amylaceous substances, and in some cases a small quantity of saccharine matter of the nature of mannite. One of the most useful nutritious species is *Cetraria islandica*, "Iceland moss," which, after being deprived of its bitterness by boiling in water, is reduced to a powder and made into cakes, or is boiled and eaten with milk by the poor Icelanders, whose sole food it often constitutes. Similarly *Cladina rangiferina* and *Cl. sylvatica*, the familiar "reindeer moss," are frequently eaten by man in times of scarcity, after being powdered and mixed with flour. Their chief importance, however, is that in Lapland and other northern countries they supply the winter food of the reindeer and other animals, who scrape away the snow and eagerly feed upon them. Another nutritious lichen is the "Tripe de Roche" of the Arctic regions, consisting of several species of the *Gyrophorei*, which when boiled is often eaten by the Canadian hunters and Red Indians when pressed by hunger. But the most singular esculent lichen of all is the "manna lichen," which in times of drought and famine has served as food for large numbers of men and cattle in the arid steppes of various countries stretching from Algiers to Tartary. This is derived chiefly from *Lecanora esculenta*, which grows unattached on the ground in layers from three to six inches thick over large tracts of country in the form of small irregular lumps of a grayish or white color. Speaking of the distribution of these nutritive lichens, whose qualities depend on the presence of amylaceous matter, Doctor Lindsay (in *Pop. Hist. Brit. Lich.*, p. 82) very appropriately remarks that, "by a beautiful provision of nature, they occur precisely under the circumstances where they are most wanted—in northern or arctic countries, or on arid steppes, where grain stuffs are unknown, and food of a better kind is often scarce or deficient." In connection with their use as food we may observe that of recent years in Scandinavia and Russia an alcoholic spirit has been distilled from *Cladina rangiferina* and extensively consumed, especially in seasons when potatoes were scarce and dear. Formerly also *Sticta pulmonaria* was much employed

in brewing instead of hops, and it is said that a Siberian monastery was much celebrated for its beer which was flavored with the bitter principle of this species.

Medicinal Lichens.—During the Middle Ages and even in some quarters to a much later period, lichens were extensively used in medicine in various European countries. Many species had a great repute as demulcents, febrifuges, astringents, tonics, purgatives, and anthelmintics. The chief of those employed for one or other, and in some cases for several, of these purposes were *Cladonia pyxidata*, *Usnea barbata*, *Ramalina farinacea*, *Evernia prunastri*, *Cetraria islandica*, *Sticta pulmonaria*, *Parmelia saxatilis*, *Physcia parietina*, and *Pertusaria amara*. Others again were believed to be endowed with specific virtues, e.g., *Peltigera canina*, which formed the basis of the celebrated "pulvis antilyssus" of Dr. Mead, long regarded a sovereign cure for hydrophobia; *Platismis juniperinum* lauded as a specific in jaundice, no doubt on the *similia similibus* principle from a resemblance between its yellow color and that of its jaundiced skin; *Peltidea aphthosa*, which on the same principle was regarded by the Swedes, when boiled in milk, as an effectual remedy for the *aphthæ* or rash on their children. Almost all of these virtues, general or specific, were imaginary; and at the present day, except perhaps in some remoter districts of northern Europe, only one of them is employed as a remedial agent. This is the "Iceland moss" of the druggists' shops, which is undoubtedly an excellent demulcent in various dyspeptic and chest complaints. Probably also *Pertusaria amara*, from the intensely bitter principle which it contains, might still with propriety be employed as a febrifuge. No lichen is known to be possessed of any poisonous properties, although *Chlorocarpum vulpinum* is believed by the Swedes to be destructive to wolves when powdered and "mixed with pounded glass." Nor are lichens, as has sometimes been alleged, injurious to the trees upon which they grow, except to a very limited extent. Not being parasites properly so called, the only injury they can inflict upon them is by slightly interfering with the functions of respiration, or when growing very crowdedly upon the branches of orchard trees, by checking the development of buds.

1. **Habitats of Lichens.**—These are extremely varied, and comprehend a great number of very different substrata. Chiefly, however, they are the bark of trees, rocks, the ground, mosses, and, rarely, perennial leaves. (a) With respect to *corticole* lichens, some prefer the rugged bark of old trees (e.g., *Ramalina*, *Parmelia*, *Stictia*), and others the smooth bark of young trees and shrubs (e.g., *Graphidei* and some *Lecideæ*). Many are found principally in large forests (e.g., *Usnea*, *Alectoria jubata*); while a few occur more especially on trees by roadsides (e.g., *Physcia parietina* and *Ph. pulverulenta*). In connection with *corticole* lichens may be mentioned those *lignicole* species which grow on decayed or decaying wood of trees and on old pales (e.g., *Caliciei*, various *Lecideæ*, *Xylographa*). (b) As to *saxicole* lichens, which occur on rocks and stones, they may be divided into two sections; viz., *calcicole* and *calcifugous*. To the former belong such as are found on calcareous and cretaceous rocks, and the mortar of walls (e.g., *Lecanora calcarea*, *Lecideæ calcivora*, and several *Verrucariæ*), while all other *saxicole* lichens may be regarded as belonging to the latter, whatever may be the mineralogical character of the substratum. It is here worthy of notice that the apothecia of several *calcicole* lichens (e.g., *Lecanora Prevostii*, *Lecideæ calcivora*) have the power (through the carbonic acid received from the atmosphere) of forming minute favoli in the rock, in which they are partially buried. (c) With respect to *terricole* species, some

prefer peaty soil (e. g., *Cladonia*, *Lecidea decolorans*), others calcareous soil (e. g., *Lecanora crassa*, *Lecidea decipiens*), others argillaceous soil or hardened mud (e. g., *Collema limosum*, *Peltidea venosa*); while many may be found growing on all kinds of soil, from the sands of the sea-shore to the granitic detritus of lofty mountains, with the exception of course of cultivated ground, there being no agrarian lichens. (d) *Muscicole* lichens again are such as are most frequently met with on decayed mosses and jungermannias, whether on the ground, trees, or rocks (e. g., *Leptogium muscicola*, *Gomphillus calicioides*). (e) The *epiphyllous* species are very peculiar as occurring upon perennial leaves of certain trees and shrubs, whose vitality is not at all affected by their presence as it is by that of fungi. In so far, however, as is known, they are very limited in number (e. g., *Lecidea Bouteillei*, *Strigula*). With the exception of these last, it is to be observed that all the rest may, under different conditions of locality and climate, be found growing for the most part indiscriminately on the substrata mentioned, a normally saxicole species becoming corticole, a terricole one becoming muscicole, and *vice versa*. Among other instances of this that might be adduced, the case of *Lecidea geographica*, a peculiarly saxicole species, growing on the stems of *Rhododendron* in the Tyrolean Alps, and that of *Lecidea rivulosa*, a like peculiarly saxicole species growing on the bark of trees in Germany, are especially striking. Sometimes also various lichens occur abnormally in such unexpected habitats as dried dung of sheep, bleached bones of reindeer and whales, old leather, iron and glass, in districts where the species are abundant. Consequently it is apparent that in many cases lichens are quite indifferent to the substrata on which they occur, whence we infer that the preference of several for certain substrata depends upon the temperature of the locality or that of the special habitat. Thus in the case of saxicole lichens the mineralogical character of the rock has of itself little or no influence upon lichen growth; which is influenced more especially and directly by their physical properties, such as their aptitude for imbibing and retaining heat and moisture. As a rule lichens have a propensity for open exposed habitats, though some are found only or chiefly in shady situation; while, as already observed, scarcely any occur where the atmosphere is impregnated with smoke. Many species also prefer growing in moist places by streams, lakes, and the sea, though very few are normally, and probably none entirely, *aquatic*, being always at certain seasons exposed for a longer or shorter period to the atmosphere (e. g., *Lichina*, *Leptogium rivulare*, *Endocarpon fluviale*, *Verrucaria maura*). Some species are entirely parasitical on other lichens (e. g., various *Lecideæ* and *Pyrenocerpei*), and may be peculiar to one (e. g., *Lecidea vitellinaria*) or common to several species (e. g., *Habrothallus parmeliarum*). A few, generally known as *erratic* species, have been met with growing unattached to any substratum (e. g., *Parmelia revoluta*, var. *concentrica*, *Lecanora esculenta*); but it seems somewhat doubtful if these are really free *ab initio* (vide Crombie in *Journ. Bot.*, 1872, p. 306). It is to the different characters of the stations they occupy with respect to exposure, moisture, etc., that the variability observed in many types of lichens is to be attributed. The fact also that in numerous instances they are so indifferent to the nature of their habitats clearly shows that they do not at all depend upon the substratum for their nourishment.

2. *Distribution of Lichens.* From what has now been said it will readily be inferred that the distribution of lichens over the surface of the globe is regulated, not only by the presence of suitable substrata, but also and

more especially by atmospherical and climatal conditions.

LICHFIELD, a city and municipal and parliamentary borough of Staffordshire, England, is situated in a pleasant and fertile valley, on a small tributary of the Trent, and on the South Staffordshire Railway, sixteen miles north from Birmingham. Population (1901), about 12,500.

LICHTENBERG, formerly a small German principality, on the west bank of the Rhine, inclosed by the Nahe, the Blies, and the Glan, now forms the circle of St. Wendel in the government district of Treves, Rhenish Prussia. The area is 210 square miles, and the population 45,000.

LICHTENBERG, GEORG CHRISTOPH, physicist and satirical writer; was born at Oberramstadt, near Darmstadt, Germany, July 1, 1744, and died in 1799.

LICINIUS. Publius Flavius Galerius Valerius Licinianus Licinius, Roman emperor, of Dacian peasant origin, was born probably about 250 A. D., and was elevated after the death of Severus to the rank of Augustus by Galerius, his former friend and companion in arms, on November 11, 307. In March, 313, he entered into alliance with Constantine at Milan, and in the following month inflicted a decisive defeat on Maximin at Heraclea, with the result of establishing himself as master of the East, while Constantine (now his brother-in-law) was supreme in the West. In the following year his jealousy led him to encourage a treasonable enterprise on the part of Bassianus against Constantine. When his perfidy became known a civil war ensued, in which he was twice severely defeated—first near Cibalis in Pannonia (October 8, 314), and next in the plain of Mardia in Thrace; the outward reconciliation, which was effected in the following December, left Licinius in possession of Thrace, Asia Minor, Syria, and Egypt, but added numerous provinces to the Western empire. In 323 Constantine, tempted by the "advanced age and unpopular vices" of his colleague, anew declared war against him, and having defeated his army at Adrianople (July 3, 323), succeeded in shutting him up within the walls of Byzantium. The defeat of the superior fleet of Licinius by Crispus, Constantine's eldest son, compelled his withdrawal to Bithynia, where a last stand was made; the battle of Chrysopolis (September 18th), finally issued in his submission and death.

LICK OBSERVATORY is built on the lowest (4,227 feet) of the three summits of Mount Hamilton, twenty-six miles by a fine mountain road east of San Jose, Cal. For its erection and equipment \$700,000 were left by James Lick (1796-1876), an American millionaire, whose remains are interred in a vault within the foundations of the pier that supports the great telescope. This instrument has an object-glass of thirty-six inches in aperture, the founder requiring it to be "superior to and more powerful than any telescope yet made"; and it is provided with a photographic attachment which enables it to be used as a gigantic camera in the photography of stars. When completed the observatory was made over to the University of California.

LIDDELL, HENRY GEORGE, joint author of *Liddell and Scott's Greek Lexicon*, was born in 1811, and educated at Charterhouse and Christ Church, Oxford, Eng., where he took a double first in 1833. He was made tutor of his college, and in 1845 professor of Moral Philosophy in his university. After acting for nine years (1846-55) as head-master of Westminster School, he returned to Christ Church as dean. From 1870 to 1874 he was vice-chancellor of the university. The *Lexicon* (1843; 7th and definitive ed. 1883) was based on the German one of Passer. It soon became

indispensable to every serious student of Greek, and a smaller edition was issued for the use of schoolboys, an intermediate one in 1890. Dr. Liddell's fellow-worker in his great achievement of English scholarship was Robert Scott, D.D. (1811-87), master of Balliol College (1854-70), and then Dean of Rochester. Dr. Liddell is the author of a very useful *History of Rome*, (1855), of which there is also an abridged edition, *The Student's Rome*. Died at London, Jan. 19, 1898.

LIDDESDALE, in Roxburghshire, Scotland, the valley of Liddel Water, which flows twenty-seven miles south-southwestward near to or along the border, till it joins the Esk twelve miles north of Carlisle.

LIDDON, HENRY PARRY, D.D., was born in 1829, at Taunton, Eng., the son of a medical man, and went up to Christ Church, Oxford, where in 1850 he graduated B.A. with a second-class in classics, and in 1851 obtained the coveted Johnson theological scholarship. Ordained in 1852 as senior student or fellow of Christ Church, from 1854 to 1859 he was vice-principal of Cuddesdon Theological College. He was appointed prebendary of Salisbury Cathedral in 1864, and was select preacher at Oxford in 1863-65, 1870-72, 1877-79, and 1884. Dr. Liddon was a member of the Hebdomadal Council at Oxford from 1866 to 1875. In the former year he delivered his famous Bampton Lectures on the *Divinity of Our Lord* (1867; 13th ed. 1889). In 1870 Dr. Liddon was created Canon Residentiary of St. Paul's Cathedral, and in the same year was appointed Ireland professor of the Exegesis of the Holy Scripture in Oxford University, when he was created D.D. and honorary D.C.L. He resigned the Ireland professorship in October, 1882, in consequence of ill health, and owing to the same cause it is understood that he more than once afterward declined a bishopric. Canon Liddon's sermons have exercised a profound influence upon the thought of the time, and many of them have been published, including those upon his friends Pusey and Bishop Wilberforce, the sermons preached before the University of Oxford, Lent lectures, and discourses on church troubles. Dr. Liddon strongly opposed the Church Discipline Act of 1874, and as warmly supported by letters in the *Times* Mr. Gladstone's crusade against the Bulgarian atrocities in 1876. He took a great interest in the Conference for the Reunion of the Churches held at Bonn in 1875, and translated Professor Rensch's account of the conference, writing also a preface for the same work. Canon Liddon was the most able and eloquent exponent of Liberal High Church principles. He had long been engaged on the life of Dr. Pusey, when he died suddenly at Weston-super-Mare, September 9, 1890.

LIEBER, FRANCIS, a distinguished publicist and writer on political science, was by birth a German, by adoption a citizen of the United States. He was a son of Frederick William Lieber, and was born at Berlin, March 18, 1800. Upon the return of Napoleon Bonaparte from Elba, young Lieber, then only fifteen years of age, volunteered as a soldier, and served with his two brothers under Marshal Blücher in the campaign of 1815. When the Greek revolution broke out, young Lieber instantly resolved to take part in the struggle for Grecian independence. He made his way with great difficulty to Marseilles, traveling much of the way on foot, and thence embarked for Greece. His experiences there are recorded in his *Journal in Greece*, published at Leipsic in 1823, and at Amsterdam in the same year under the title of *The German Anacharsis*. In 1825 he abandoned his country, and after spending a year in London came to the United States (1827), and as soon as possible was naturalized as a citizen of this country. Lieber took up his residence at Boston, and was occu-

pied for five years in his laborious work, *The Encyclopedia Americana*, (13 vols.) In 1832 he removed to New York, where he published a translation of De Beaumont and De Tocqueville's work on the penitentiary system, with many notes. In 1833 he went to Philadelphia to prepare a plan of education for Girard College, then newly founded. While there he published *Letters to a Gentleman in Germany* and a supplement to his *Encyclopedia*. In 1835 he was appointed professor of history and political economy in South Carolina College at Columbia, S. C., where he remained more than twenty years, and during this period wrote and published the three great works upon which his fame as a writer chiefly rests—the *Manual of Political Ethics* (1838), *Legal and Political Hermeneutics* (1839), and *Civil Liberty and Self-Government* (1853).

In 1856 Lieber resigned the professorship in South Carolina College, and was immediately elected to a similar professorship in Columbia College, New York, and to the chair of political science in the law school of the same institution. He continued in the discharge of the duties of these positions until his death, which occurred October 2, 1872. During the great war for the preservation of the Union, from 1861 to 1865, Lieber rendered services of great value to the government of his adopted country, and was frequently consulted by the secretary of war. He was one of the first to point out by his pen the madness of secession, and was ever active in supporting the government and upholding the Union. He prepared, upon the requisition of the president, the *Code of War for the Government of the Armies of the United States in the Field*, which was adopted and promulgated by the government in General Orders, No. 100, of the war department. This code has been characterized by many European publicists as a masterpiece, and it suggested to Bluntschli his codification of the law of nations, as may be seen in the preface to his *Droit International Codifié*. During this period, also, Lieber wrote his *Guerilla Parties with Reference to the Laws and Usages of War*, a valuable contribution to the law of war. At the time of his death he was, by the appointment of the government of the United States, the umpire of the commission for the adjudication of Mexican claims. The political writings of Francis Lieber are held in great estimation by all publicists.

LIEBIG, JUSTUS, was born at Darmstadt in 1803. His father carried on business as a dyer and dealer in dyestuffs, and made various experiments with a view to improved methods of preparing and purifying his wares. These led the son to take an interest in chemistry, and to seek for knowledge in the chemical books and periodicals in the grand-ducal library, which is rich in scientific works. He determined to be a chemist, to devote his life to the pursuit of science. The only kind of chemist available for teaching purposes was the chemist and druggist, and accordingly Liebig, at the age of fifteen, entered the shop of an apothecary at Heppenheim near Darmstadt to study chemistry. He soon found out how great is the difference between practical pharmacy and scientific chemistry, and returned to Darmstadt, after ten months, to look for another and more likely way of attaining his object. After some months spent in study at home he entered the university of Bonn, which he soon left for Erlangen. There he attended the lectures of Kastner on chemistry, and, besides the study of allied sciences, devoted some time to make up for the almost total neglect of schoolwork caused by his early love of chemistry. In 1822 he left Erlangen with the degree of Ph.D. By means of the liberality of Louis I., grand-duke of Hesse-Darmstadt, Liebig was enabled to continue his chemical studies in Paris. There he made

the acquaintance of Runge, Mitscherlich, and Gustav Rose. He attended the lectures of Gay-Lussac, Thénard, and Dulong, and, while carrying on the investigation into the composition and properties of the fulminates which he had already partly published, he attempted, as at Erlangen, to work up his neglected school studies. The results of his work on the fulminates were communicated to the Academy of Sciences, and attracted the favorable attention of Humboldt, who was at that time in Paris. Humboldt introduced Liebig to Gay-Lussac, who admitted him into his private laboratory as a pupil. Here he had opportunities of learning all the mysteries of the art from one of the most skillful and ingenious of experimenters. It was on the advice of Humboldt that Liebig determined to become a teacher of chemistry. After examination his Erlangen degree was recognized, and in 1824, in his twenty-first year, he was appointed extraordinary professor of chemistry in the university of Giessen. Two years later he was promoted to the post of ordinary professor, which he held for twenty-five years, notwithstanding the most tempting offers from other universities. It was here, in the small town and small university of Giessen, that by far the most of Liebig's work was done. He began by remedying the evil which as a student he had himself felt. He induced the Darmstadt Government to build a chemical laboratory in which any student of the university might obtain a thorough practical training.

The amount and the importance of the laboratory work done by Liebig in Giessen were very great. During the twenty-six years he spent at Giessen as ordinary professor, he contributed to scientific journals more than two hundred papers, about twenty of which were records of joint work, chiefly with Wöhler. During the same time he published his works on organic analysis, organic chemistry, chemistry applied to physiology and agriculture, his *Chemical Letters*, and many smaller treatises. From 1832 he was joint editor of the *Annalen der Pharmacie*, from 1837 of the *Handwörterbuch der reinen und angewandten Chemie*, and from 1847 to 1856 of the *Jahresbericht der Chemie*. In 1845 he was raised to the hereditary rank of baron under the title of Freiherr von Liebig. In 1852 he accepted the invitation of the Bavarian Government to the ordinary professorship of chemistry in the university of Munich. This office he held till his death in 1873.

LIECHTENSTEIN, a sovereign and independent principality, the smallest in Austria, is bounded on the northeast and east by the Austrian Vorarlberg, on the south by the Swiss canton of Grisons, and on the west by the Rhine, while on the north it tapers almost to a point. The state, consisting of the lordships of Vaduz and Schellenberg, is only fifteen miles in length, hardly over five miles in its average breadth, and comprises an area of sixty-five square miles. Population (1900), about 10,000.

LIEGE (Ger., *Lüttich*), a city of Belgium, the chief town of the province of Liège, is situated fifty-six miles east of Brussels. It occupies a remarkably fine position on the banks of the Meuse, which at this point is joined by the Ourthe. On the left-hand side stands the older city with the citadel and the more important historical buildings; on the right hand lies the lower and more modern portion, commanded by the fort of the Chartruse. The river, there 460 feet across, is spanned by several bridges, of which the Pont des Arches, rebuilt in 1860-63, dates originally from the eighth century, and plays a prominent part in the local annals. Place St. Lambert is the historical center of Liège. Here still stands the noble building—erected (1508-40) by Cardinal de la Marck in a late Gothic style—which,

down to the revolution, was the palace of the prince-bishops, and is now, with its modern extensions, occupied by the public courts and other administrative offices. The university of Liège, established in 1817, is a flourishing institution with about forty professors and 800 students, a library of 100,000 volumes, a botanic garden, a school of mines (1825), a school of arts and manufactures, a normal grammar school, and several other auxiliary foundations. There is no theological faculty, the theological seminary, with a large library of its own, being an independent institution. The city further possesses a blind asylum, a deaf and dumb institute, schools of design, painting, and music, a zoological garden, a municipal museum, etc. The Place d'Avroi is adorned by an equestrian statue of Charlemagne by Jehotte; and in front of the theater stands a bronze statue of Gretry, the composer, who was born at Liège.

Liège is the center of a great mining district rich in coal, lead, zinc, and iron; the coal-mines extend under the city and the river. In 1879 358,100 tons of coal were raised in the province, 22,156 persons being employed in the pits. The iron, lead, and zinc foundries in the town and neighborhood work up large quantities of ore in addition to the local supply. Steel, copper, and tin wares, steam-engines and general machinery, woolen goods, excellent saws and files, nails, needles, mirrors, clocks, leather, paper, and oil are among the products of the versatile industry of the place. Liège firearms have long enjoyed a wide reputation. They give employment to about 30,000 workmen, who for the most part work in their own houses, though in 1878 a large factory was erected in the American style for making all parts of the weapon by machinery. The trade of Liège is favored by the fact that the town is an important junction on the Rhenish Belgian Railway, commands more than one navigable river, and has long been one of the leading cattle-markets in the country. The population (1901) was 173,708.

LIEGNITZ, the capital of a district of the same name in the Prussian province of Silesia, is picturesquely situated on the Katzbach, just above its junction with the Schwazwasser, and forty miles west-northwest of Breslau. Population (1901), 54,839, about one-sixth being Roman Catholics.

At Wahlstatt, near Liegnitz, the tide of Mongolian invasion was stemmed, in 1241, in a hard-fought battle between the Tartars and the Christian chivalry under the duke of Silesia. In 1760 Frederick the Great gained a decisive victory near Liegnitz over the Austrians under Laudon, and in 1813 the list of important battles in this neighborhood was completed by Blücher's defeat of the French at the battle of the Katzbach.

LIEN, in English and American law, properly means a right of detaining goods of another in your possession until a debt due to you from the owner of the goods is paid. To the original or common law conception of a lien it would appear to be necessary that the goods over which lien is claimed should be actually in the possession of the creditor, and further that the debt should have been incurred with reference to the goods which are detained. Such is the lien of the workmen to whom articles are delivered for the purpose of being operated upon by him in the way of his trade. He is entitled to keep the article he has worked at until remuneration for his labor has been made to him. Of precisely the same character is the lien of the carrier over the goods conveyed by him, for the fare; of the farrier over the horse which he has cured, for his fee; of blacksmiths, shipwrights, and other artificers for the wages they have earned by working at or on the thing detained. In the United States the principle of the particular lien has been developed in a notable manner in protecting the

rights of workmen employed in building. At common law, the building belongs absolutely to the owner of the soil; and accordingly, when a house is erected by contract, the contractor may receive payment from his employer and may fail to pay the laborers he has employed, who are consequently left without redress. The "mechanic's liens," created by statute in several of the American States, give laborers a lien over the building which they have erected for their unpaid wages. Notice having been filed in the prescribed manner, they acquire a right to have their wages paid out of the property, which may, if necessary, be sold for that purpose.

LIERRE, or LIER, a town of Belgium, in the province of Antwerp, nine and a-half miles southeast of Antwerp (on the railway to Malines), at the junction of the Great and Little Neethe. It is a busy place of 18,000 inhabitants, and manufactures silk, lace, and shoes, beet-root sugar, and a peculiar kind of white beer known as *cuvresse*.

LIFE ASSURANCE. See INSURANCE.

LIFEBOAT. It will be convenient to consider here, not the lifeboat simply, but also other means of saving life at sea.

The qualities of the lifeboat first deserve attention. These are such that this boat is able to live in seas, and go into positions of danger, that would overwhelm ordinary boats or insure their destruction. Eight important qualities are possessed by it in a very high degree—(1) buoyancy; (2) great lateral stability, or resistance to upsetting; (3) the power to right itself if upset; (4) the power of immediate self-discharge when filled with water; (5) strength; (6) stowage room for a large number of passengers; (7) speed against a heavy sea; (8) facility in launching and taking the shore.

The *buoyancy* of the Royal National Life Institution's lifeboat of England, or its inability to sink, be it ever so deeply laden, is secured chiefly by means of a watertight deck or floor, air-cases around the sides inboard, and two large air-chambers, one in the bow, the other in the stern. The "extra buoyancy" thus obtained cannot be too great so long as it does not interfere with the space necessary for working the boat and stowing shipwrecked persons. The air-cases around the sides serve also to confine any water shipped to the center of the boat, a point of great importance. There is an air-tight space between the boat's floor and its bottom, filled partly with air partly with cork-ballast, which gives it additional buoyancy, but the air-chambers above the floor would float the boat even if she were stove in and this space filled with water. In a thirty-three-foot boat the buoyancy obtained by all its chambers is equal to eleven and a quarter tons.

Stability is obtained chiefly by means of ballast. Immense difficulty was experienced in arriving at the present form of the institution's splendid boat, because qualities of differing value had to be sacrificed to each other in due proportion. Thus, while breadth of beam secured stability, it seriously interfered with the self-righting quality. Ballast, therefore, in the form of a heavy iron keel, instead of breadth, became necessary to give the requisite stability.

The *self-righting* power is due to the large elevated air-chambers in bow and stern, coupled with great sheer, or rise fore and aft, of gunwale, to the iron keel, which weighs about nine hundredweight in a thirty-three-foot boat, and to the air-cases and ballast, which latter weighs from seven to eight hundredweight. When the boat is upset it cannot rest on its two elevated air-chambers; it necessarily rolls on one side, then the heavy iron keel and ballast come into play and drag it back to its right position in a few seconds. This principle of self-righting was discovered—at all events

first exhibited—at the end of last century, by the Rev. James Bremner of Orkney, but was not finally adopted till the middle of the present century.

The *self-emptying* quality depends chiefly on the well-known physical fact that water must find its level. The floor of the lifeboat, on which the men's feet rest when seated on the thwarts, is placed so as to be very slightly—two or three inches—above the level of the sea when the boat is fully manned and loaded. In this floor there are six holes of six inches diameter, into which are fitted six metal tubes. These pass through the boat's bottom into the sea. The water, of course, enters them, but cannot rise above them into the boat, because it cannot rise above its own level. Valves at the upper ends of the tubes, opening downward, prevent the annoyance of water spouting in, but allow it freely to run out. When, then, a billow overwhelms the boat, and fills it, the water rushes violently down the discharging tubes until it reaches the sea-level; by that time it has descended below the level of the floor and left the boat empty. So complete and swift is the process that a filled boat frees herself in about half a minute. This principle was first applied by the institution in 1851. Lifeboats devoid of the self-discharging quality become temporarily useless when filled by a sea, as they can be emptied only by the slow and laborious process of baling.

Strength, that will enable the lifeboat to suffer treatment which no ordinary boat could stand, is dependent on peculiarity of construction and material. The best Honduras mahogany is used, and the diagonal plan of construction adopted—that is, the boat has two distinct "skins" of planking, both sets of planks being laid on in a position diagonal to the boat's keel and contrary to each other, besides passing around from gunwale to gunwale under the boat instead of from stem to stern as in ordinary boats. The skins have a layer of prepared canvas between them, and thus great strength and elasticity are combined.

The *carriage* of the lifeboat is an essential adjunct for the purpose of conveying it over any kind of road or beach to the place where it may be required. It can be run deep into a raging surf, and the boat, with its crew seated and oars ready out, can be launched at once, by blocks and tackle, so as to enable the men to dash forward and meet the incoming rollers with sufficient force to propel it through or over the seas, and thus avoid the risk of being hurled back on the beach. Each lifeboat is furnished with a set of spare oars, as these are frequently broken.

The *lifebelt* of the institution is a part of the equipment of the lifeboat which merits special attention, because it is a very efficient contrivance, and has been the means of saving many lives in time past. It is made of cork fastened on canvas, and combines great buoyancy with strength and flexibility. It not only floats a heavily-clothed man head and shoulders above water, but enables him to support a comrade easily—the extra buoyancy being twenty-five pounds. One of its distinctive features is its division at the waist, by which means great freedom of action is allowed. It serves also as a species of armor to protect the wearer's most vital parts from blows against rock or wreck, while it affords some degree of warmth.

Rocket Apparatus.—This, next to the lifeboat, is the most important and successful means by which shipwrecked persons are rescued. Many vessels are cast every year on the rocky parts of the coast, under cliffs, where no lifeboat could be of service. In such places the rocket alone is available. It is worked by the men of the coastguard, with the aid, in a few places, of volunteer rocket brigades. The courage and skill displayed in its

use are evinced by the saving of many lives every year, and by the fact that a large proportion of the medals given by the lifeboat institution for heroic conduct are awarded to the men of the coastguard, who, besides managing the rockets, frequently man the lifeboats and also effect rescues in their own boats.

The apparatus consists of five principal parts, viz., the rocket, the rocket-line, the whip, the hawser and the sling life-buoy. The mode of working it as follows: A rocket, having a light line attached to it, is fired over the wreck. By means of this line the wrecked crew haul out the whip, which is a double or endless line, rove through a block with a tail attached to it. The tail-block, having been detached from the rocket-line, is fastened to a mast, or other portion of the wreck, high above the water. By means of the whip the rescuers haul off the hawser, to which is hung the traveling or sling life-buoy. When one end of the hawser has been made fast to the mast, about eighteen inches above the whip, and its other end to tackle fixed to an anchor on shore, the life-buoy is run out by the rescuers, and the shipwrecked persons, getting into it one at a time, are hauled ashore. Sometimes, in cases of urgency, the life-buoy is worked by means of the whip alone, without the hawser.

The *United States Life-Saving Service* is chief among the lifeboat societies of all nations, both as regards the extent of coast embraced and the amount of work done. There are several points of difference between this service and that of England which are noteworthy. In the first place the whole or nearly the whole of its support is provided for by annual grants of money from congress. Secondly, besides protecting its vast extent of seaboard, it has to provide for the shores of its great lakes, or fresh-water seas. Then, the coasts of America are destitute of human habitations in many places, which renders necessary the constant employment of surfmen for the express purpose of looking out for vessels in distress and manning the surfboats. It also necessitates the erection of houses of refuge, provisioned so as to afford shelter and food to shipwrecked crews for a considerable time, at places where, without such provision, those who escape the sea would probably perish from hunger and exposure.

The shores of the United States—lakes and sea—are over 10,000 miles in extent, embracing almost every variety of climate and formation of land. This vast extent of coast-line is divided into 12 districts, with a total of 179 stations. Of these 139 are on the Atlantic, 34 on the lakes, and 6 on the Pacific. Those on the desolate coast of Florida are houses of refuge only, without boats or apparatus. Many of the stations are closed during the fine months of the year, their crews being disbanded till the winter gales again summon them to the heroic and dangerous work of saving the shipwrecked. That they render noble service in this way may be gathered from the annual reports.

Owing to the flat shores of the Atlantic coast, and the sparseness of the population, heavy boats are found unsuitable. Only a few boats on the English model exist in the service. The boats chiefly in use are surfboats, incapable of self-righting, and liable to be swamped, but which, nevertheless, seem well suited for the work, and are admirably managed. They are very light, and can, on their transporting carriages, be easily dragged along the shore by their crews. The cork lifebelts worn by the men are of the plan first designed in 1854 by Rear Admiral Ward. For projecting a line over a stranded vessel, the Americans prefer the mortar, or other piece of ordnance, to the rocket. In addition to the traveling life-buoy, they use a metallic car, or small covered boat, which can hold three or four

persons, who, entering it by a small manhole, are shut in and drawn ashore, safely protected from injury, even though overturned by the surf. This clever contrivance has been of great service in rescuing invalids, children, and aged persons.

The history of the United States Life-Saving Service may be said to have begun in 1848, though half a century before that the Humane Society of Massachusetts had erected some huts of shelter and stationed some boats on the coast. In that year the United States Government was led to consider the subject of loss on their shores, chiefly through the energy of the Hon. W. A. Newell, of New Jersey, a member of the House of Representatives. Captain Douglass Ottinger (the inventor of the life-car) was charged with the management and reconstruction of the service. The impetus given to it at this time was never quite lost. Again, in 1854, renewed efforts were made to improve the service, but no great progress was made till the year 1871, when the present effective system was organized; new stations were built; the patrol system between the stations was introduced; the regular keeping of journals and sending in of reports was ordered; libraries for the use of the men were sent to stations; uniformity in signals was arranged, and a thorough reform in all departments accomplished.

LIFTS may properly be held to include all sorts of apparatus whose object is the lifting of weights. When the apparatus consists of comparatively small, separate, and portable pieces it is called *lifting tackle*. When the lifting apparatus reaches that degree of size and complication that entitles it to be called *machinery*, there seems to be no general technical term that will include all kinds, but for the different classes of lifting machines there are such special names as *cranes*, *hoists*, *elevators*, *lifts*, *winding engines*, and *lift pumps*.

There is very little distinction made between hoists, elevators, and lifts. The word *hoist* refers more particularly to machines used in warehouses and factories for raising goods from one story to another. They are worked by hand or by power, and are for comparatively light loads. *Elevator* is used in two different senses. It refers to apparatus for lifting passengers or freight to the upper stories of buildings. It also refers to the very different sort of apparatus used in grain-mills and storehouses for transferring the grain from one floor to another. The grain is drawn along channels or pipes, which are sometimes vertical and more often inclined, by means of a rotating archimedean screw, or of a strap continuously traveling upward through the interior of the channel and carrying, fastened to it, a series of small buckets. Occasionally, if the inclination to the horizontal be small, a broad strap of the same width as the bottom of the channel runs along that bottom, and carries the grain with it simply lying on its upper surface. This latter method of transportation is more efficient, however, as a horizontal carrier or distributor than as a means of lifting. *Lifts* are constructed either for raising passengers in buildings or for heavier loads, such as freighted trucks and wagons, or the superstructure of bridges and large roofs during their erection.

In lifts or elevators the working force is either hand, steam, or hydraulic power. Gas-engines are unsuitable as direct sources of power for lifts, but they may be advantageously used to store hydraulic power in an accumulator from which water is supplied to work an hydraulic lift. Electricity has quite recently been used, but has not yet been tried sufficiently to allow of any valuable opinion being formed of its ultimate practical success.

The lift consists of (1) a box or "cage" to contain

the persons or material to be raised; (2) a vertical square well or shaft, to the walls of which are attached guides to prevent the cage swinging to and fro; (3) a rope or chain by which to haul the cage upward from above, or else a long rod or pillar by which to push it up from below; (4) a "barrel" or "sheave" over which to wind the chain or rope, and which is mounted on a shaft lying in bearings firmly supported by the building, or else a cylinder to contain water or steam to actuate the lifting rod; (5) mechanism through which the working power is transmitted to the barrel, or else water or steam piping connecting the cylinder above mentioned with the source of power; and (6) the driving engine or other source of power.

Most accidents happen to lifts through the hauling chain or rope breaking. For the sake of safety, therefore, particular care should be exercised in the choice of material for this part, and an appliance should always be attached to the cage whereby, if the rope breaks, the cage is caught immediately in whatever position it may be at the time of the breakage.

For light loads hempen ropes are sufficient and more convenient than chains, because they are noiseless in their action. If of the best quality (Manila) they are quite as reliable as ordinary chains, and an advantage claimed for them is that their gradual destruction by wear becomes easily apparent, and gives timely warning before they become dangerous, whereas the failure of a chain may take place without any easily visible previous sign having been given. For very heavy loads, however, chains or wire ropes should be used in preference to hempen ropes. Wire ropes may be made stronger for a given weight per foot of length than chains are, but, unfortunately, as commonly manufactured their quality cannot be certainly relied on. Like hempen ropes, they are almost noiseless. To insure smoothness and noiselessness in passenger lifts, the sheave over which the rope passes is lined in the groove with leather.

For the sake of safety, the rope by which the cage hangs is often duplicated. Sometimes even three or four are used. In order that these should give additional safety, each rope must be capable of supporting the load by itself. Generally the load is lifted by one or other kind of power, and descends by the weight of the cage itself. This weight is always much more than sufficient for the purpose, and therefore counterpoises are introduced to balance the greater part of it, thus lessening the work to be done during ascent by an amount equal to the product of the balance weight and the height of the lift. In the commonest arrangement, the balance weights are hung on the same rope as that by which the cage is suspended. This passes over a pulley whose diameter is half the width of the well, so that the cage end of the rope rises vertically from the center of the roof of the cage. This pulley is keyed on a horizontal shaft, which is driven by power from below, either directly by means of a rope or chain passing over another pulley, or else through intermediate spur gearing. The actual working rope is in this case not attached to the cage. Less frequently the rope from the engine forms one of the suspenders of the cage, the balance weights being attached by separate ropes.

The rope or chain by which the load hangs has to be so strong that its own weight is very considerable. A large excess of strength being more in demand in this kind of machinery than in other kinds, a greater stress than about one ton per square inch cannot be put upon the chain or rope (supposed to be of iron). This would make the rope weigh 3.4 pounds per foot of length for every ton of load carried. If the height of lift were, for example, sixty feet, then, comparing the top and bottom positions of the cage, there would be in the former

sixty feet less of rope on the cage side of the pulley, and sixty feet more on the counterpoise side, than in the latter position, so that if the counterweight just balanced the load when the cage was at the bottom, it, along with the rope, would outweigh the cage in its highest position by the weight of 120 feet of rope, that is, 408 pounds for every ton of load, or nearly one-fifth of the whole load. Since the whole load—that is, that of cage, ropes, and passengers or goods—is three or four and sometimes five or six times as great as the net load, this is a very serious increase on the *unavoidable* loss of balance resulting from the fact that the cage is alternately loaded and unloaded. The difficulty can be got over by extending the rope downward from the balance weight to pass underneath a grooved pulley at the bottom of the well, and up from this to the under side of the cage, where it is attached. There will then be an equal length of rope always hanging on each side of the top bearing pulley; but an extra amount of friction occurs at the bearing journals due to the weight of the extra rope. The lower half of the rope may be of cheap, inferior material, since there is very little stress upon it.

LIGHT. Sound may be defined as any effect on the sense of hearing, and in the same way light may be defined as any effect on the sense of sight. This is the purely subjective use of the terms. But both terms are quite as frequently used in the objective as in the subjective sense. Thus, as sound may be defined in terms of the motion of the air in the cavity of the external ear, mechanically affecting the tympanum, so light may be defined by the mechanical effect produced upon the extension of the optic nerve which forms the sensitive surface of the retina.

In treating of light it will be convenient to use the term in a sort of mixed sense, at least until we come to discuss the different theories which have been devised to account for the propagation of the agent which causes vision. Then we shall have to use the term entirely in the objective sense. On the other hand, in Physiological Optics we are concerned chiefly with the subjective sense of the term.

It is to sight that we are mainly indebted for our knowledge of external things. All our other senses together, except under very special conditions, do not furnish us with a tithe of the information we gain by a single glance. And sight is also that one of our senses which we are able most effectively and extensively to aid by the help of proper apparatus—not merely (as by spectacles, invented *circa* 1300) for the cure of natural defects, but (as by the telescope and microscope) for the examination of bodies either too distant or too minute to be studied by the unassisted eye.

It is very remarkable, under these circumstances, to find how slowly men have reached some even of the simplest facts of optics. We can easily understand how constant experience must have forced on them the conviction that light usually moves in straight lines—*i.e.*, that we see an object in the direction in which it really lies. But how they could have believed for ages that objects are rendered visible by something projected from the eye itself—so that the organ of sight was supposed to be analogous to the tentacula of insects, and sight itself a mere species of touch—is most puzzling. They seem not till about 350 B.C. to have even raised the question—if this is how we see, why cannot we see in the dark? or, more simply—What is darkness? The former of these questions seems to have been first put by Aristotle. The nature and laws of reflection were, of course, forced on the ancients by the images seen in still water; and the geometers of the Platonic school were well acquainted with these laws. To Hero of Alexandria we owe the important deduction from

them that the course of a reflected ray is the shortest possible.

The general nature of refraction also was known, with some of its special applications, such as, for instance, to burning-glasses and to magnifiers. These were probably either spherical glass shells filled with water or balls of rock crystal.

In the first century of our era Cleomedes pointed out how a coin at the bottom of an empty cup, where the eye cannot see it, can be made visible by filling the cup with water; and he showed that, in a similar way, the air may render the sun visible to us while it is still under the horizon. Shortly after this date Ptolemy (the celebrated astronomer) published his great work on *Optics*. He treats of vision, reflection, the theory of plane and concave mirrors, and refraction. He measured, with considerable accuracy, the angles of incidence and refraction, for rays passing from air into water and into glass, and from water into glass; it was not, however, till more than fifteen hundred years had passed that the true relation between these angles was discovered. In addition to what has just been mentioned, the ancients' knowledge of optics was limited to a very superficial acquaintance with some of the properties of rainbows, halos, mirage, etc. But it was fragmentary in the extreme, though it far surpassed in amount as well as in accuracy their knowledge of the other branches of physical science.

It is not easy to understand the ideas of the ancients about color. That it is a property of a body—just as its density, its hardness, or its smell is a property—was probably held by them. But they also imagined that a body could communicate its color to light; thus, for instance, the clouds were, by some of them, supposed to communicate their colors to the sunbeams which form a rainbow.

Our next glimpse of real progress dates from the eleventh or twelfth century, when ALHAZEN (*q.v.*) wrote a treatise on optics in Arabic, which for five hundred years or more was a recognized authority on the subject. It was, in many parts, founded on the work of Ptolemy, but with considerable additions and improvements. Alhazen gives an anatomical description of the eye, and points out, fairly enough, how with two eyes we see only one image. But he also points out that we see each object, however small, by a *pencil* of diverging rays—not (as the ancients imagined) by a single ray. Alhazen accounts for twilight, and shows how by it to measure the height of the atmosphere. He also gives the now generally received explanation of the curious fact that the sun and moon appear larger when rising or setting than when they are high in the heavens. The farther progress of the subject we need not now trace. From the end of the sixteenth century that progress has been extremely rapid. Before we commence a more rigorous treatment of the subject, it may be well to make a few preliminary statements as to the nature of *vision* and the condition for *distinct vision*. Properly speaking these belong to OPTICS (*q.v.*), but it is impossible to treat intelligibly any part of our subject without presupposing some, generally very slight, knowledge of other parts. And the few preliminary statements we have now to make are in no respect theoretical, while they are so simple that anyone may at once test their truth for himself.

Except in the case of a very abnormal eye (extremely short-sighted or long-sighted as the case may be) there is a distance from it—usually somewhere about ten inches—at which, if an object be placed, it is seen more distinctly than if placed at any other distance. Almost everyone, perhaps without his knowing it, habitually places at or about that distance from his eye an object

which he wishes to examine carefully. When he places it at a smaller distance he becomes conscious of the *effort* required to see it distinctly. He has, in fact, to alter the form of the optical machinery of the eye, by a muscular effort, so that it may become capable of bringing to a focus on the retina rays more divergent than those for which the parts were in their unstrained state adapted. A corresponding effort, but usually much more slight, is commonly felt to be required if the object be at a distance greater than ten inches. Hence we arrive at the conclusion that, for the minimum of strain on the eye, rays should fall on it diverging as if they came from a point about ten inches distant. But for all ordinary eyes any divergence from double of this (*i.e.*, divergence as if from a distance of five inches) to zero (*i.e.*, parallel rays) is consistent with the possibility of distinct vision. Rays either more divergent than the former limits, or convergent, are unfit to produce distinct vision. Hence every optical instrument, whatever be the reflections or refractions to which light has been subjected in passing through it, must finally allow the light to escape either in parallel rays or with a divergence within the above specified limits, if it is to be employed by an ordinary eye. The comparatively slight differences which exist among ordinary eyes are easily compensated by the rack-work, or screw adjustment, which is invariably attached to the eyepiece of a good telescope and to the body of a good microscope. Every motion of this rack-work alters the divergence of the rays as they finally escape from the instrument. Any eye, however abnormal, if it be capable of producing distinct vision at all, has only to be furnished with suitable spectacles in order that it may behave exactly as does a normal eye. This statement, however, refers only to sharpness of definition, not in any degree to *color*. The deficiency which causes *color-blindness* cannot be supplied by any conceivable process. A definite part of the ordinary organ of vision is wanting (or inactive) in such cases—while the merely optical parts of the eye are usually in perfect order.

Another fact which must be stated here is that, to produce vision of a body in its natural position, the image on the retina, as seen from the back, must be inverted—not merely as regards up and down, but also as regards right and left. Thus, in the ordinary astronomical telescope the image on the retina is not inverted, and we, therefore, see an inverted image. A third is that our judgment of the relative distances of objects is formed mainly by the use of the two eyes simultaneously. One eye, kept still, can inform us only of relative distance in virtue of the greater or less effort to see distinctly (already spoken of). With both eyes, or with one eye moved from side to side, *parallax* comes in, and gives us the *stereoscopic* effect, as it is called. This power of judging distance is, of course, greater as the eyes are set more widely apart. There is, practically, no limit to the effective distance between the eyes when the proper instrumental methods (as with the telescope) are employed.

It is also necessary to premise a few words about color. The various homogeneous rays of the solar spectrum have each a color of its own which no refraction can modify. But what about the many colors which do not occur in the spectrum? To such a question as "What is yellow?" the answer is, "*Each particular kind of yellow may be any one of an infinite number of different combinations of homogeneous rays.*" And the same is true, in general, of all other colors. Clerk Maxwell found that a yellow equivalent to that of the spectrum can be obtained by mixing in proper proportions certain homogeneous red and green rays. This single example is sufficient to show that the color-sense

is of a very singular nature. This question will be treated in OPTICS (PHYSIOLOGICAL); but for our present purpose it is only necessary to say that we now know that the normal eye has only *three color-sensations*—a red, a green, and a violet—and that the apparent color of any light which falls on it depends merely on the *relative intensities of the excitement* produced by the light on the three organs of sense corresponding to these sensations. This is true, however, only within certain limits of intensity; for extremely bright light, whatever be its real color, seems to excite all the three sensations simultaneously, much as white light does; and with very feeble light (as, for instance, that of an ordinary aurora or of a lunar rainbow) we are sometimes scarcely conscious of colors. In *color-blindness* one or more of these organs of sense is wanting, or imperfect. The most common form, Daltonism, depends on the absence of the red sense. Great additions to our knowledge of this subject, if only in confirmation of results already deduced from theory, have been obtained in the last few years by Holmgren, who has experimented on two persons, each of whom was found to have one color-blind eye, the other being nearly normal. In this way was obtained, what could otherwise have been matter of conjecture only, a description of color-blind vision in terms of (at least approximately) normal vision.

Finally, the sensation of sight is not limited to the duration of the mechanical action on the eye. It is known that we do not see a sudden flash (an electric spark, for instance) until a measurable, though very short, period has elapsed. This depends on the rate at which an excitation is propagated along the optic nerve. But the familiar experiment of whirling a red-hot stick in a dark room shows that the sensation of sight lasts for a short period after the mechanical action which produced it has ceased. This period is probably different for different eyes, and for different amounts of excitement even in the same eye. (If the light be very intense the effect lasts much longer, but completely changes its character.) For our present purpose it may be assumed that the duration is somewhere about $\frac{1}{10}$ of a second. Thus, if the end of the red-hot stick describes a circle once in $\frac{1}{10}$ of a second, we see the complete circle; if in a longer period, we only see at once such a part of it as was described in $\frac{1}{10}$ of a second. Connected with this is the remarkable result obtained experimentally by Swan, that the amount of sensation is, for flashes of short duration, directly proportional, not only to the brightness of the flash, but also to its duration. A flash which lasts for $\frac{1}{10}$ of a second produces the full effect on the eye; but an electric spark, as a flash of lightning, which certainly does not endure for more than $\frac{1}{100000}$ of a second, produces at most only $\frac{1}{100000}$ of the effect it would produce if it lasted $\frac{1}{10}$ of a second. On this short duration of visual impressions depends the action of the *thaumatrope*, the *wheel of life*, etc. By various kinds of machinery a succession of views of an object in different positions or forms is presented to the eye, each for a brief interval. The result is that we fancy we see one and the same object going through a species of *continuous* motion, or of change of form, which would present it to the eye in these successive positions or forms. Thus, a tadpole may be represented as wiggling about, or as developing continuously into a frog, etc.

The main source of light is *incandescence*. (It is usually understood that to be incandescent a body must be at a high temperature.) This may be due to any of a number of causes, such as the following:—

The Potential Energy of Gravitation of Scattered Fragments of Matter.—When these fall together, as in

the formation of the sun and stars, heat enough is generated by impact to render the whole vividly incandescent. It is probable that the light of nebulae and the *proper* light of comets are due to this cause. The proximate cause, in all these cases, is the kinetic energy of the fragments before impact. To this class, therefore, can be reduced the light given out when a target is struck by a cannon shot.

The Kinetic Energy of Current Electricity or of an Electric Discharge.—Here we have lightning, the electric light, and probably also the light of the aurora.

The Potential Energy of Chemical Affinity.—The limelight, gaslight, candle and lamplight, firelight, the magnesium light, etc.; also phosphorus, dead fish (?), etc., glowing in the dark.

Friction, as in the trains of sparks from a grindstone or brake; though here, in general, chemical affinity also has a share.

Sudden Great Compression of a Gas, as of air by meteoric stones and falling stars.

Another very curious source, not (so far as is known), reducible to incandescence, is the *giving out (usually in an altered form) of light previously absorbed*—fluorescence, phosphorescence, etc.

A third source is *physiological*—fireflies, glowworms, *Medusa*, dead fish (?), etc., the eye of a cat.

Any not black and not transparent body, exposed to any of these sources of light, becomes in its turn what may for our purpose also be treated as a source.

As will be shown in RADIATION, the only bodies which, when incandescent, give *every* constituent of white light, are bodies which are black in the sense of absorbing each and every ray which falls upon them. Such bodies are not *necessarily* solids—though the best examples we have of them are lampblack, and (somewhat less perfect) charcoal and gas-coke.

GEOMETRICAL OPTICS.—It is approximately true that, in any homogeneous medium, *light moves in straight lines*. If an opaque body be placed anywhere in the straight line between the eye and an object the object is concealed. Through a long straight tube no objects can be seen but those situated in the direction of its axis produced. This is so fundamental a fact, or it is so evident a result of experience, that it is the foundation of every process which involves the direction in space of one object as regards another—whether it be for the aiming with a rifle, the pointing of a telescope, or for the delicate observations of a geodetic survey. But we must carefully observe the restrictions under which the statement is made. Not merely is it said to be only approximately true, but it is so only in a homogeneous medium.

(a) On this is founded the geometrical theory of *shadows*—a subject of some importance, especially as regards eclipses. In this application the results may be considered as absolutely true, though the statement is liable in certain delicate cases to somewhat startling exceptions. When an opaque body is placed between a screen and a luminous *point* it casts a shadow on the screen. (The sun's image formed by a lens or burning-glass of short focus is our best mode of attempting to realize the conception of a luminous point; but a fair approximation may be made by piercing a very small needle-hole in a large plate of thin metal, and placing it close to any bright flame or incandescent body.) The outline of the shadow is, of course, to be found by drawing straight lines from the luminous point so as to touch the opaque body all around. These lines form a cone. The points of contact form a line on the opaque body separating the illuminated from the non-illuminated portion of its surface. Similarly, when these lines are produced to meet the screen, their points of intersection with it form a line which separates

the illuminated from the non-illuminated parts of the screen.

This line is called the boundary of the *geometrical shadow*. A common but beautiful instance of it is seen when a very small gas-jet is burning in a ground-glass shade, near the wall of a room. In this case the cone, above mentioned, is usually a right cone with its axis vertical. Thus the boundary of the geometric shadow is a portion of a circle on the roof, but a portion of an hyperbola on the vertical wall. If the roof be not horizontal, we may obtain in this way any form of conic section. Interesting and useful hints in *projection* may be obtained by observing the shadows of bodies of various forms cast in this way by rays which virtually diverge from one point: *e.g.*, how to place a plane quadrilateral of given form so that its geometric shadow may be a square; how to place an elliptic disk, with a small hole in it, so that the shadow may be circular, with a bright spot at its center, etc.

When there are more luminous points than one, we have only to draw separately the geometrical shadows due to each of the sources, and then superpose them. A new consideration now comes in. There will be, in general, portions of all the separate geometrical shadows which overlap one another in some particular regions of the screen. In such regions we still have full shadow; but around them there will be other regions, some illuminated by one of the sources alone, some by two, etc., until finally we come to the parts of the screen which are illuminated directly by all the sources. There will evidently be still a definite boundary of the parts wholly unilluminated, *i.e.*, the true shadow or *umbra*, and also a definite boundary of the parts wholly illuminated. The region between these boundaries—*i.e.*, the partially illumined portion—is called the *penumbra*.

LIGHTFOOT, JOHN, an eminent rabbinical scholar, the son of Thomas Lightfoot, vicar of Uttoxeter, Staffordshire, was born at Stock-upon-Trent, Eng., in 1602, and died in 1657.

LIGHTFOOT, JOSEPH BARBER, D.D., Bishop of Durham, was born at Liverpool in 1823, and educated at Trinity College, Cambridge, where he graduated B. A. in 1851 as a wrangler, senior classic, and Chancellor's medalist. He was elected a Fellow of his college in 1852, and gained the Norris University prize in 1853. Ordained in 1854, he became tutor of Trinity College in 1857, Hulsean professor of Divinity at Cambridge in 1861, canon of St. Paul's Cathedral in 1871, and Lady Margaret professor of Divinity at Cambridge in 1875. He received his doctor's degree in 1864, was Whitehall preacher in 1866, was appointed examining chaplain to the Archbishop of Canterbury in 1868, honorary Fellow of Trinity College, Cambridge, in 1872, select preacher at Oxford, 1874-75, and one of the Deputy Clerks of the Closet to the Queen, February, 1875. In 1879 Dr. Lightfoot accepted with great reluctance the bishopric of Durham, in succession to Dr. Baring. Although confessedly the most learned New Testament scholar in the church, his powers of administration had not been tested; but in the end his appointment was not only justified so far as the diocese of Durham was concerned, but in the wider interests of the Church of England at large. While pursuing in private his own studies, he made Bishop Auckland a center of learning and teaching for his clergy. He likewise devoted himself with untiring energy to the practical work of his see, and speedily gained the affection and confidence of all with whom he came into contact. The work of the Church Temperance Society and the White Cross Army was specially furthered by his exertions. His munificence was un-

bounded, and one of his last acts was to build a church at Sunderland, as a thank-offering for what seemed to be his recovery from a serious illness in 1888. Dr. Lightfoot's influence at Cambridge as a great Christian teacher was of incalculable importance, his high personal character as well as his learning having immense weight and influence. A supreme grammarian and painstaking textual critic, he gave the world admirable commentaries on the epistles of Paul to the *Galatians* (1865), *Philippians* (1868), *Colossians* and *Philemon* (1875), to each of which were appended interesting dissertations. Unhappily he was unable to complete the Pauline Epistles, and his exhaustive work on the Apostolic Fathers remains also a splendid fragment, embracing only the two epistles ascribed to *Clement of Rome* (1869; Appendix, 1877; new ed. 1890), and *Ignatius and Polycarp* (1885; 2d ed. 3 vols. 1889). Other works were *On a Fresh Revision of the English New Testament* (1871), an edition of Dean Mansel's treatise on *The Gnostic Heresies of the First and Second Centuries* (1875), and four volumes of sermons published posthumously in 1890. He contributed to the *Journal of Philology*, Dr. Smith's *Dictionaries of the Bible*, of *Christian Antiquities*, and *Christian Biography*, and published in successive numbers of the *Contemporary Review* a crushing and detailed answer to the anonymous writer of *Supernatural Religion* (collected 1889). Dr. Lightfoot, who was never married, died at Bournemouth on December 21, 1889.

LIGHTHOUSE. The primary and most important consideration relating to the design and construction of a lighthouse tower which is to be built within the tide-mark is the force of the waves which may be expected to assail it, and the directions and heights at which that force will act on the building. The great waves which are found in the open ocean cannot be generated in smaller seas; and, with a due regard to economy in construction, ought not, therefore, to be provided against. What is wanted is to ascertain in such shorter seas the height of waves in relation to the length of "fetch" in which they are generated, and next to determine their energy when on reaching the shore or a sunken rock, and so ceasing to be waves of oscillation, they enormously increase their destructive force by becoming waves of translation. The law of increase in the height of waves was found by Mr. T. Stevenson to be proportional to the square root of the distance from the windward shore, and the greatest force recorded on rocks exposed to the ocean was three and one-half tons per square foot. The relative forces of summer and winter gales were found to be as one to three, and the vertical force, after acting on a curved sea-wall, was eighty-four times greater than the horizontal force at a height of twenty-three feet above high water. The history of the ancient lighthouses is of so scanty a nature that we may pass at once to more modern works, commencing with Winstanley's Eddystone light.

The Eddystone Rocks, which lie about fourteen miles off Plymouth, are fully exposed to the southwestern seas. The lighthouse was completed by Winstanley in four seasons. In 1698 it was finished at a height of eighty feet and the light exhibited; but in 1699, in consequence of damage by storms, the tower was increased by an outer ring of masonry four feet thick, and made solid from the foundation to nearly twenty feet above the rock. The height was increased to nearly 120 feet, and completed in 1700. During the well-known hurricane of November 20, 1703, the tower was destroyed. In general design as well as in details this work must be placed among the *vetanda* of maritime engineering. For example, in plan it was polygonal instead of circular. In his blind devotion to ornamentation Winstanley

violated throughout the principles of uniformity of outer profile so as to present great obstructions to the action of the waves.

Rudyard's Eddystone Tower.—This work was commenced in 1706 and completed in 1709, in the form of a frustum of a cone ninety-two feet high. The work consisted principally of timber, the lower part being oak carefully bolted together, and also to the rock. Above the lower structure of oak courses of stone, cramped together and fixed to the timber work and to the rock, were added in order to give weight to the structure. This lighthouse stood for forty-six years, and was destroyed by fire in 1755. In every respect the simplicity of the structure and the judicious character of the details of the design may be regarded as models of engineering.

Smeaton's Eddystone Tower.—This justly celebrated work, which consisted entirely of stone, was commenced in 1756, and the masonry was finished in 1759. Smeaton was the first engineer who adopted a structure of masonry for a sea tower and dovetailed joints for the stones, which averaged a ton in weight. This work cannot be regarded as a safe model for general imitation in exposed situations, and Rudyard's earlier tower was certainly as successful in resisting the forces to which it was exposed. Rudyard unquestionably selected for so small a rock as the Eddystone a preferable form to that adopted by Smeaton. Smeaton's reasoning about the similarity of a tower exposed to the surf and an oak tree resisting the wind was very conclusively shown to be fallacious by the late Mr. Alan Stevenson. A new tower has lately been erected in place of Smeaton's by Mr. Douglass.

Bell Rock Lighthouse Tower.—The Bell Rock, which lies twelve miles off the coast of Forfarshire, is fully exposed to the assaults of the German Ocean. The rock is of considerable extent but of a low level, the tower being covered about sixteen feet at high water of spring tides. Mr. R. Stevenson, of Edinburgh, when he first landed on the rock, decided to adopt a stone tower as Smeaton had done at the Eddystone, but he deviated largely from that design in the thickness of the walls, in raising the tower to 100 feet instead of 68 feet, and the level of the solid to twenty-one feet above high water instead of eleven feet. Instead of employing arched floors as at the Eddystone, he adopted lintel stones for the floors which formed part of the outward walls, and were feathered and grooved as in carpentry, besides having dovetailed joggles across the joints where they formed part of the walls.

There are a great many other lighthouses in Ireland, India, and America which merit more attention than our space admits of, and we shall therefore conclude with directing the attention of the engineer to the important influence of the configuration of rocks in modifying the breaking waves. It cannot excite surprise that some of the structures which were erected on the Eddystone should have withstood the waves so long as they did. This fact seems to lead to the conclusion that the Eddystone Rock, at one time at least, acted to some extent as a shelter to the structures which were built on it. During a summer gale when Dhu Heartach lighthouse was being erected fourteen stones each of two tons weight, which had been fixed on the tower by joggles and Portland cement at the level of 37 feet above high water, were torn out and swept off into deep water. At the Bell Rock stones of two tons weight were several times swept away during the construction of the tower, while it is a remarkable fact that no stones were ever moved at the Eddystone. But what is more striking, the thin glass panes of Winstanley's first tower stood successfully through a whole winter's storms at the same

level above the water as that at which the fourteen heavy blocks were swept away at Dhu Heartach, where it was found necessary from the experience acquired when constructing the lighthouse to raise the solid base of the tower to nearly the same height above the water as the glass panes in Smeaton's tower, which have hardly ever been broken during the storms of more than 100 years.

The conclusion then which seems fairly deducible from these facts is that the level of the plane of dangerous impact of the waves above high water depends upon the relation subsisting between their height and the configuration of the rocks above and below high water, as well as perhaps on the configuration of the bottom of the sea near the lighthouse. Thus, while the rock at Dhu Heartach, from its height above high water, forms a great protection against the smaller class of waves, it operates as a dangerous conductor to the largest waves, enabling them to exert a powerful horizontal force at a much higher level than they would had the rock been lower. The lighthouse engineer must therefore beware of taking it for granted that Smeaton's Eddystone tower is a model for general imitation, and must carefully consider as best he can in what way the configuration of the rock may affect the stability of the tower which he has to design.

What is required of every lighthouse apparatus is either the equal distribution of the rays constantly or periodically over the whole horizon, or else their unequal distribution over certain azimuths only.

The first of these two cases, viz., the equal distribution of the light, will be best understood by explaining the different manner in which the rays are operated on by the apparatus for a fixed light and by that for a revolving light. The characteristic of a *fixed* light, which is that of being seen constantly and always of the same power around the whole horizon, might no doubt be perfectly produced by a naked flame without any apparatus, but then all the rays which did not fall on the navigable track of shipping would be lost to the sailor. In order then to intercept and utilize those rays which, instead of falling on this navigable track, would either go upward to the sky or downward on the shore close to the lighthouse tower, and on that part of the sea which is very near the shore, we must have recourse to optical agents both for bending down the rays which naturally point too high, and for bending up those which point too low. It thus appears that the apparatus for a fixed light should bend the rays in the vertical plane only, but should not interfere with their natural horizontal divergence in azimuth.

The demands which are made on a light that has to *revolve* are not nearly so great as on one that is fixed, for the revolving light does not, like the fixed, require to illuminate the whole horizon simultaneously, but only each point of it at successive intervals of time. When the dark intervals occur, the rays from the flame which are then pointing in the direction of the dark spaces should therefore have their direction so altered laterally as to pass into the adjoining light spaces and thus to increase the power of the luminous flashes. A revolving light, though supplied by a flame of the same power as a fixed, will thus necessarily be far more intense, as it does not lose its power by diffusing the rays constantly over the whole horizon, but gathers them up into a number of separate bundles or beams of great intensity. The apparatus of a revolving light has consequently more optical work to do than that of a fixed, for the rays must be bent not only in the vertical plane but laterally in the horizontal and in all intermediate planes as well.

In the construction of lighthouse apparatus either metallic or glass agents may be employed, but it has been found by experiments that a great saving of light

(about 25 per cent.) is effected when glass only is used. All kinds of apparatus may conveniently be ranged either under the *catoptric system*, where metallic reflection only is used, the *dioptric*, where the material employed is wholly glass producing refraction and total reflection, or the *catadioptric*, in which both glass and metal are employed.

LIGHTING, ELECTRIC. Artificial light is generally produced by raising some body to a high temperature. If the temperature of a solid body be greater than that of surrounding bodies it parts with some of its energy in the form of radiation. While the temperature is low these radiations are not of a kind to which the eye is sensitive; they are exclusively radiations less refrangible and of greater wave-length than red light, and may be called infra-red. As the temperature is increased the infra-red radiations increase, but presently there are added radiations which the eye perceives as red light. As the temperature is further increased, the red light increases, and yellow, green, and blue rays are successively thrown off. On pushing the temperature to a still higher point, radiations of a wave-length shorter even than violet light are produced, to which the eye is insensitive, but which act strongly on certain chemical substances; these may be called ultra-violet rays. The problem of the artificial production of light with economy of energy is the same as that of raising some body to such a temperature that it shall give as large a proportion as possible of those rays which the eye happens to be capable of feeling. For practical purposes this temperature is the highest temperature we can produce. As an illustration of the luminous effect of the high temperature produced by converting other forms of energy into heat within a small space, consider the following statements:—120 cubic feet of fifteen-candle gas will, if burned in ordinary gas burners, give a light of 360 standard candles for one hour. The heat produced by the combustion is equivalent to about 60,000,000 foot-pounds. If this gas be burned in a gas-engine, about 8,000,000 foot-pounds of useful work will be done outside the engine, or four-horse power for one hour. This is sufficient to drive an "A" Gramme machine for one hour; the energy of the current will be about 6,400,000 foot-pounds per hour, about half of which, or only 3,200,000 foot-pounds, is converted into radiant energy in the electric arc, but this electric arc will radiate a light of 2,000 candles when viewed horizontally, and two or three times as much when viewed from below. Hence 3,000,000 foot-pounds changed to heat in the electric arc may be said roughly to affect our eyes six times as much as 60,000,000 foot-pounds changed to heat in an ordinary gas burner. Owing to the high temperature at which it remains solid, and to its great emissive power, the radiant body used for artificial illumination is nearly always some form of carbon.

The consideration of electric lighting naturally divides into two parts—the production of suitable electric currents, and the conversion of the energy of such currents into radiations. Although electric lights were first produced from currents generated by batteries, they have only attained commercial importance by the use of machines for converting mechanical energy into electric current.

Dynamo-Electric Machines.—In the widest sense a dynamo-electric machine may be defined as an apparatus for converting mechanical energy into the energy of electrostatic charge, or mechanical power into its equivalent electric current through a conductor. Under this definition would be included the electrophorus and all frictional machines; but the term is used in a more restricted sense for those machines which produce electric currents by the motion of conductors in a magnetic

field, or by the motion of a magnetic field in the neighborhood of a conductor. For the general laws of electromagnetic induction see **ELECTRICITY**. Since, if the current in a closed circuit be in one direction when the number of lines of force is increasing, it will be in the opposite direction when they are diminishing, it is clear that the current in each part of the circuit which passes through the magnetic field must be alternate in direction. Hence also the current in the wire outside the machine must also be alternate, unless something of the nature of a commutator be employed to reverse the connections of the internal wires, in which the current is induced, and the external circuit. We have then broadly two classes of dynamo-electric machines:—The simplest, the alternate current machine, where no commutator is used; and the continuous current, in which a commutator is used to change the connections to the external circuit just at the moment when the direction of the current would change.

It has been shown that to produce a continuous current a commutator is needed. If there is but a single wire in the armature, or if there are more than one, but all are under maximum electromotive force at the same time, the current outside the machine, though always in the same direction, will be far from uniform. This irregularity may be reduced to any extent by multiplying the wires of the armature, giving each its own connection to the outer circuit, and so placing them that the electromotive force attains a maximum successively in the several circuits. A practically uniform electric current was first commercially produced with the ring armature of Pacinotti as perfected by Gramme. Suppose a straight bar, electromagnet, surrounded by a coil of copper wire from end to end. Let the electromagnet be bent with the copper wire upon it until its ends meet and it forms an annulus or anchor ring. Let the two ends of the copper wire be connected, so that the iron core is surrounded by an endless copper wire, and you have the Pacinotti or Gramme ring. This ring rotates about its axis of figure between two diametrically opposed magnetic poles of opposite name. The ring may at any instant be supposed divided in halves by a diameter perpendicular to the diameter joining the center of the poles. Equal and opposite electromotive forces act on the copper wire of the two halves, giving two opposite electric poles half way between the magnetic poles. If electric connections could be maintained with these two points as the ring revolves, a continuous current would be drawn off. In practice this is only approximated to. The copper wire is divided into a series of equal sections, and at the point of junction of each section with its neighbor a connection is made with a plate of a commutator, having as many divisions as there are divisions of the copper coil. Collecting brushes bear upon the commutator plates, which are connected to the coil nearest to the point of maximum potential. Owing to the self-induction and mutual induction of the several coils of the armature, this point is displaced in the direction of rotation when a current is being drawn off, to an extent greater as the current is greater in relation to the strength of the magnetic field. The magnetic field in the Gramme and other continuous dynamo-electric machines may be produced in several ways. Permanent magnets of steel may be used as in the smaller machines now made, and in all the earlier machines; these are frequently called magneto-machines. Electromagnets, excited by a current from a smaller dynamo-electric machine, were introduced by Wilde; these may be described shortly as dynamos with separate exciters. The plan of using the whole current from the armature of the machine itself for exciting the magnets was proposed almost simultane-

ously by Siemens, Wheatstone, and S. A. Varley. For some purposes it is advantageous to divide the current from the armature, sending the greater part through the external circuit, and a smaller portion through the electromagnet, which is then of very much higher resistance, as the electromagnet is a shunt to the external circuit. Machines so arranged are sometimes called shunt dynamos. The last two arrangements depend on residual magnetism to initiate the current, and below a certain speed of rotation give no practically useful electromotive force.

In discussing the comparative efficiency of dynamo-machines there are two points to be examined—(1) how much of the power applied is converted into energy of current in the whole circuit, whether external or in the wires of the armature or of the electromagnets, and (2) how much of the power is available outside of the machine. The practical sources of loss are friction of bearings, and of the brushes on the commutator, electric currents induced in the iron of the machine, production of heat in the copper wire of the armature due to its resistance, and production of heat in the wire of the electromagnet due to its resistance. There is also a certain loss in sparks upon the commutator. The currents in the iron core are reduced by dividing the iron by insulating surfaces perpendicular to the electromotive force tending to produce such currents. The loss by resistance of wire in armature and magnets greatly depends on the dimensions of the machine.

The simplest way of obtaining light from an electric current is by passing it through a considerable resistance in such small compass that the conductor becomes intensely hot. It is of course necessary that the conductor shall be able to endure a very high temperature without injury. Iridium and platinum-iridium wire have been employed, but are too expensive for commercial use. Hitherto the only available substance is carbon, in the form of a thread or filament. This carbon must be protected from the air by inclosing it in a glass globe from which every trace of air has been removed. An electric current passing through a carbon filament obeys Ohm's law, as through a metallic wire. But in metals the resistance increases as the temperature rises, in carbon it diminishes. The filament or thread of carbon being inclosed in a vacuum space, the energy of current converted into heat in the filament only leaves it in the shape of radiations. To light economically, it is necessary to heat the filament to such a temperature that the greatest possible proportion of these radiations shall belong to that part of the spectrum to which the eye is sensitive, *i.e.*, to the highest temperature the filament will stand. The fundamental problem of incandescent electric lighting is to produce a carbon thread the substance of which shall permanently stand the highest possible temperature, to make good electrical connection between the ends of the filament and the conducting wires, and above all to secure that the thread shall be uniform throughout its length, for the current which can be safely used is limited by the weakest point of the filament. Several inventors have recently succeeded in meeting these conditions, but their relative merit and priority cannot be discussed here.

The lamps of Werdermann, Reynier, and Joel are intermediate between arc lamps and incandescent lamps, and present the distinctive advantages of neither.

Sir Humphry Davy discovered that if two pieces of carbon were placed in contact with each other, and the current from a battery of a sufficient number of elements were passed from one piece to the other, the current did not cease when the carbons were slightly parted, but that the current passed across the intervening space,

causing an intensely high temperature and consequently brilliant light. The pieces of carbon gradually burned away, the positive carbon being consumed more rapidly than the negative. When an electric current passes through a conducting solid body maintained at a constant temperature, the difference of potential on the two sides of the body has a constant ratio to the current passing through; this constant ratio is known as the electric resistance of the body at its then temperature. No such constant ratio exists in the case of the electric arc. If you increase the current passing between two carbons at a small distance apart, you do not materially change the difference of potential at the two ends of the electric arc. It is, therefore, not strictly appropriate to speak of the resistance of the electric arc; the appropriate constant, or approximate constant, for an electric arc is the difference of potential between the two sides of the arc. However near the carbons approach without touching, this does not fall below a certain minimum value, and as the carbons are separated its value increases. In ordinary practice with continuous currents the potential of the electric arc may be taken as ranging from thirty-five to forty-five volts. If the current in amperes be multiplied by the difference of potential in volts, and the product be divided by 746, we have the power used in the arc itself in horse-power, that is, the power effectively used in lighting. The mechanism of an electric lamp has two functions to perform: it has first to bring the carbons into contact and then part them, or simply part them if they are initially in contact when the light is started, or when it is accidentally extinguished (this is called striking the arc); it has also to bring the carbons together as they are consumed. The former function is always accomplished by an electro-magnet or solenoid. In the electric candles, *e.g.*, those of Jablochhoff, Rapiéff, Wilde, or Siemens, the carbons are approximately parallel, and they burn down as does a candle—the arc being forced to the ends of the carbons by the repulsion of the current in the carbons on the electric arc. In the ordinary arc lamps the carbons have their axes in the same line, and their approach or recession must be controlled by the current passing through, by the difference of potential, or by both combined. When the same current passes through a succession of lamps in series, it is clear that the regulation cannot be by the current alone, as this is the same for all the lamps, and might be maintained constant by the adjustment of any one only of the lamps.

The first generating machines were "magneto-electric" revolving coils in front of permanent steel magnets (or revolving magnets in front of coils), but later machines are "dynamo-electric," based on a discovery simultaneously made by Werner Siemens, Varley, and Wheatstone, that by revolving coils in front of soft iron electro-magnets, the residual magnetism in the iron is gradually augmented, dynamic force being thus converted into electricity. The currents created by machines of either sort are alternate, but in most modern lights the alternate currents are made continuous by the use of a commutator. The invention of methods of using this powerful light received a great stimulus in 1876, when Jablochhoff's "candle" was invented. The Serrin, Lontin, Rapiéff, and Brush lamps are different arrangements for the production of light by means of the "arc," the adjustment of the carbons being effected by an automatic electro-magnetic regulator. The above described lamps are known as arc lights, but of late the so-called *incandescent* lamps have acquired a great importance. They are simply applications of the well-known principle that the heating effect of a current in any part of a circuit is proportional to resistance of that part. Edison, Lane Fox, Maxim,

and Swan have constructed such lamps, which differ only in details. A thin carbon filament, inclosed in a hermetically sealed vacuum tube, so as to prevent oxidation, is made luminous by the passage of a strong current along it.

Electric lighting for streets, street and railroad cars, hotels, public buildings, and houses is being extended with great rapidity, especially in the United States. Many cities, even of comparatively small size, are lighted in greater or less degree by the arc system. The incandescent system is applied to hotels, theaters, and public buildings generally, and is deservedly a favorite as an adjunct to artistic decoration as well as a safe and efficient illuminant.

LIGHTNING. See METEOROLOGY and THUNDER-STORMS.

LIGHTNING CONDUCTOR, or LIGHTNING ROD, is the name usually given to apparatus designed to protect buildings or ships from the destructive effects of lightning. The title is misleading; for when properly constructed, lightning rods serve rather to prevent the occurrence than to ward off the effects of a flash of lightning. Damping the enemy's powder would be a most efficient precaution against cannon-shot, but it would be very inappropriately termed fortification. When a conductor charged with electricity is brought near to another conductor connected with the earth, it induces on it a charge of the opposite kind of electricity. The result is an attractive force which tends to bring the conductors nearer to one another, and to augment the electric density on their opposed surfaces. When the density is sufficiently great, there is rupture of the dielectric (air) between the conductors, and the disruptive discharge takes place as an electric spark. If one of the conductors have projective points or angles, the electric density is usually much greater at such places than over the rest of the surface. But, though the density is great at such places, the charge on them is usually small, and the discharge takes place in an almost continuous manner by a brush or glow. When, for instance, a large conductor, connected with an electric machine, is giving a rapid succession of bright sparks to a ball connected with the ground, the sparks cease as soon as a pointed wire, connected with the ground, is held in the vicinity of the conductor. No discharge is heard, but in the dark a faint glow is seen at the end of the wire, which continues as long as the machine is turned. Remove the wire and the sparks instantly recommence. This glow is known to sailors as St. Elmo's (San Telmo's) fire, in old days Castor and Pollux. Suppose now one of the conductors to be a thundercloud, the other the surface of the earth, the discharge will usually take place between the places of greatest surface density; and it will in general be the more gradual as these are more pointed, and of less capacity. Hence Franklin's idea of furnishing buildings or other prominent objects with a projecting metal spike well connected with the ground. For the purpose of preventing a lightning discharge by substituting for it what is practically a continuous electric current. To effect this object thoroughly, only three things are necessary:—(1) the points should so project from the building or ship to be protected as to prevent any great development of electric density elsewhere than on themselves; (2) they should be effectually connected with the earth; (3) the connecting rod ought to be so good a conductor as not to be injured even by a powerful electric discharge.

The first of these conditions is realized by making the rod branch out to all the salient portions of the building or ship, and furnishing it with points projecting beyond each of them. No general rule can be laid

down as to the extent of the region protected by a single point, though it may usually be assumed with safety that the region extends throughout a vertical cone whose vertex is at the point, and whose semi-vertical angle is about 45° . This is probably not true if the point be very high—on the top of a tall chimney or tower, for instance. Objects not far from the base of such a protected tower, and within the cone just described, have occasionally been damaged by lightning.

The second condition is easily fulfilled in towns by connecting the lower end of the rod with the iron gas and water-mains, which form an excellent "earth," as it is technically called. Water-pipes, being usually jointed with metallic-lead washers, are preferable to gas-pipes, which are usually put together with white lead. This condition is also easy to secure in ships and in lighthouses, where large metal plates (in the case of a ship, the copper sheathing is precisely what is required) can easily be permanently immersed in sea-water. In country houses it is usually more difficult to obtain a proper earth. Plates and tubes of metal, of large surface, buried in ground which is permanently damp, form usually the best arrangement. A well makes a good earth; a carefully constructed water tank (of stone or cement) is not an earth at all.

The third condition, so far as experience can guide us, seems to be effectually realized by making the conductor *throughout* of iron rod of an inch in diameter, or of copper rod not less in diameter than three-eighths of an inch.

LIGNE, CHARLES JOSEPH, PRINCE DE, son of an imperial field-marshal whose seat was at Ligne, near Tournai, was born at Brussels May 23, 1735, and as an Austrian soldier served at Kolin, Leuthen, Hochkirch, etc., in the war of the Bavarian succession, and at the siege of Belgrade (1789). A Belgian by birth, an Austrian subject, the favorite of Maria Theresa and Catherine of Russia, the friend of Frederick the Great, Voltaire, Rousseau, he was always a most welcome guest at the court of Versailles and in the Paris salons. He died December 13, 1814.

LIGNITE. See COAL.

LIGNUM VITÆ. See GUAIACUM.

LIGUORI, LIGUORIANISM. The name Liguorianism has been popularly given in the present century to a particular school of moral and devotional theology in the Roman Catholic church by the controversial opponents of that school, whether themselves Roman Catholics or not. It is derived from the name of one of its principal and most influential exponents, Alfonso Maria de' Liguori, a theologian, saint, and doctor of the Roman church. In strictness, the term is not accurate, for Liguori was in no sense the founder of the school, nor did he innovate upon, develop, or exaggerate its principles and maxims.

Alfonso Maria de' Liguori, son of Giuseppe de' Liguori, a Neapolitan noble, and of Anna Cavaleri de Brindes, his wife, was born at Marianella, near Naples, on September 27, 1696. He was called to the bar in due course, and obtained considerable practice, but soon adopted the ecclesiastical dress as a candidate for orders, which he received in December, 1724, when he entered as a novice into the congregation of missions, being ordained priest in December, 1726.

He soon became popular as a preacher and as a confessor, obtaining much influence in Naples and its vicinity. In 1732 he founded the "Congregation of the Most Holy Redeemer," usually known as Redemptorists, or, as they are often named, Liguorians, whose special object is the religious instruction of the rural poor and other uneducated classes, establishing the first house of the society, in the face of much opposition.

at the little town of Scala, about eight miles from Salerno. The headquarters were transferred somewhat later to Ciorani, and in 1743 to Nocera dei Pagani, which is still the chief house. The confirmation of the rule and institute was obtained from Benedict XIV. in February, 1749, and in the following year Liguori, who had previously made some minor literary ventures, published one of his most famous and popular books, *Le Glorie di Maria*, a book intended to promote the cultus of the Blessed Virgin; and in 1753 he issued his yet more celebrated *Moral Theology*, dedicating it to Pope Benedict XIV., expressly as a "via media" treatise.

In 1762, being then sixty-six years of age, he accepted the bishopric of Sant' Agata dei Goti, and in 1775 obtained permission from Pius VI. to resign his bishopric, on the plea of enfeebled health, and retired to the Redemptorist house at Nocera dei Pagani, where he died August 1, 1787, aged nearly ninety-one. He was decreed the rank of "Venerable" very speedily, being so named by Pius VI. in 1796, was beatified by Pius VII. in 1816, canonized by Gregory XVI. in 1839, and finally declared a "Doctor of the Church" by Pius IX., March 11, 1871. He is one of the most copious of the later Roman theologians, and his productiveness extended over a period of thirty years, from the issue of his *Visits to the Blessed Sacrament* in 1747 till the appearance of no fewer than eleven treatises in 1777.

LIGURIA, in ancient geography, was the name given to a portion of the northwest of Italy, including the districts on both sides of the Maritime Alps and the Apennines, which border on the Tyrrhenian Sea from the frontiers of Gaul to those of Etruria. Along the seacoast it extended from the river Varus or Var, which separated it from Gaul, to the Macra (Magra), which formed its limit on the side of Etruria, thus comprising the whole district between the mountains and the sea, now known as the Riviera of Genoa. Beside this it comprehended a broad tract to the north of the same range, formed by the underfalls of the Apennines and the hilly tract adjoining them, extending to the plains of the Padus or Po, that river itself constituting its northern limits under the Roman administration.

LILAC, *Syringa vulgaris*, L., belongs to the olive family, *Oleaceae*. The common lilac is said to have come from Persia in the sixteenth century, but according to Heuffel it is indigenous in Hungary, the borders of Moldavia, etc. Two kinds of *Syringa*, viz., *alba* and *caerulea*, are figured and described in Gerard's *Herball* (1597), which he calls the white and the blue pipe privets. The former is the common privet, *Ligustrum vulgare*, L., which, and the ash tree, *Fraxinus excelsior*, L., are the only members of the family native in Great Britain. The latter is the lilac, as both figure and description agree accurately with it. It was carried by the European colonists to northeast America, and is grown in gardens of the Northern and Middle States.

LILBURNE, JOHN, an English secretary and prolific pamphleteer, was born in 1618. At the age of twelve he was apprenticed to a clothier in London, but appears at one time to have been law-clerk to Prynne. In February, 1638, for the part he had taken in importing and circulating the *Merry Litany* and other publications of Bastwick and Prynne, offensive to the bishops, he was sentenced to be publicly whipped from the Fleet prison to Palace Yard, Westminster, there to stand for two hours in the pillory, and afterward to be kept in jail until a fine of £500 had been paid. Though gagged at the pillory, and confined in prison, he was not the man to give up his opinions or forego the pleasure of expressing them, and in the following year he did not improve his prospects of a speedy release by the kind of literary activity to which he devoted his enforced leisure. In

point of fact he did not regain his liberty until November 7, 1640, when one of the earliest recorded speeches of Oliver Cromwell was made in support of his petition to the House of Commons. In 1641 he received an indemnity of £3,000. He entered the army, and in 1642 was taken prisoner at Brentford and tried for his life; sentence would no doubt have been executed had not the parliament by threatening reprisals forced his exchange. He soon rose to the rank of lieutenant-colonel, but in April, 1645, having become dissatisfied with the general conduct of affairs, and especially with the predominance of Presbyterianism, he resigned his commission; presenting at the same time to the Commons a petition for considerable arrears of pay. His violent language in Westminster Hall about the speaker and other public men led in the following July to his arrest and committal to Newgate, whence he was discharged, however, without trial, by order of the House, in October. In January, 1647, he was again committed to the Tower for accusations which he had brought against Cromwell, but was again set at liberty in time to become a disappointed spectator of the failure of the leveling or ultra-democratic party in the army at the Ware rendezvous in the following December. The scene produced a deep impression on his mind, and in February, 1649, he along with other petitioners presented to the House of Commons a paper entitled *The Serious Apprehensions of a part of the People on behalf of the Commonwealth*, which he followed up with a pamphlet, *England's New Chains Discovered* (March 1, 1649), criticising Ireton, and another exposing the conduct of Cromwell, Ireton, and other leaders of the army since June, 1647. Finally, the *Second Part of England's New Chains Discovered*, a violent outburst against "the dominion of a council of state, and a constitution of a new and unexperienced nature," became the subject of discussion in the House, and led anew to the imprisonment of its author in the Tower on April 11th. His trial in the following October, on a charge of seditious and scandalous practices against the state, resulted in his unanimous acquittal, followed by his release in November. In January, 1652, for printing and publishing a petition against Sir Arthur Hasilrig and the Haberdasher's Hall for what he conceived to have been an injury done to his uncle George Lilburne in 1649, he was sentenced to pay fines amounting to £7,000, and moreover to be banished the Commonwealth, with prohibition of return under the pain of death. In June, 1653, he nevertheless came back from the Low Countries, where he had busied himself during the interval in pamphleteering and such other agitation as was possible, and was immediately arrested; the trial, which was protracted from July 13th to August 20th, indeed issued in his acquittal, to the great joy of London, but it was nevertheless thought proper to keep him in captivity for "the peace of the nation." He was detained successively in the Tower, in a castle at Jersey, and in Dover Castle. At Dover he came under Quaker influence, and signified his readiness at last to be done with "carnal sword fightings and fleshly bustlings and contests;" and in 1656, or giving security for his good behavior, he was set free. He settled at Eltham in Kent, frequently preaching at Quaker meetings in the place and neighborhood during the brief remainder of his troubled life. He died on August 29, 1657.

LILLE, capital of the department of Nord, France, and the ancient capital of Flanders, is situated about 155 miles by rail north of Paris, and at an elevation of seventy-five feet, in a low plain on the Deule, which flows to the Scheldt by the Lys. It is the chief fortress of the north of France, and headquarters of the first army corps, and is defended by a rampart and by a pentagonal

citadel situated to the west of the town beside the Deule. The water of the river fills the moat, and the environs of the citadel can be laid under water. The church of Notre Dame de la Trielle, in the style of the thirteenth century, which has been in process of building since 1855, occupies the site of the old Château du Buc, the original nucleus of the city. The town-house, on the site of the old palace of the duke of Burgundy, Philip the Good, was built in 1846. The exchange, which dates from the period of the Spanish domination, is in an original style. It is surmounted by a graceful campanile, and contains a statue of Napoleon I., made from cannon taken at Austerlitz. In the middle of the great square stands a column, erected in 1848, commemorating the defense of the town in 1792. There are several large hospitals, faculties of medicine and of science, a Catholic institute, comprising the five faculties of theology, letters, law, science, and medicine, an academy of music affiliated to the conservatoire at Paris, several learned societies, and a large number of various kinds of schools. The picture gallery, with upward of 800 works, is one of the richest in the provinces, and the Wicar museum contains a unique collection of original designs of the great Italian masters. The town is an important railway junction, and is also provided with tramways.

The principal industry is flax-spinning, in which thirty-five mills, with 190,000 spindles, give employment to 14,000 persons (of whom 9,000 are females). Forty thread-mills employ 2,000 persons, and fifteen factories, with 1,000 operatives, produce woollen goods worth from \$600,000 to \$800,000 per annum; 5,000 persons are engaged in cotton-spinning (115,000 spindles), to the amount of \$4,000,000. There are besides eighty factories in which damasks, tickings and the usual staples of the linen trade are manufactured; quilts and pack-sheets occupy from 6,000 to 7,000 persons, and 4,000 are employed in producing the fabric out of which the smock frocks of the peasantry are made. Connected with these industries are dye-works, bleach-fields, and establishments for the production of engines, looms, and combing and carding machines; and there are also chemical works, sugar-works, breweries, and oil-works. The state manufacture of tobacco in Lille gives employment to 1,200 persons. The total population of Lille in 1901 was 215,431.

LILLEBONNE, capital of a canton in the department of Seine-Inférieure, France, 131 miles west-north-west by rail from Paris, and twenty miles due east from Havre, is a pretty little town, picturesquely built at the foot of wooded hills, in the valley of the Bolbec, which falls into the Seine three miles lower, at Port Jérôme. Population (1901), 6,500.

LILLY, WILLIAM, an astrologer somewhat famous in his day, was born in 1602, at Diseworth in Leicestershire, England, and died in 1681.

LILY, *Lilium*, the typical genus of *Liliaceæ*, embraces nearly fifty species, all confined to the northern hemisphere, about fifteen being natives of Japan and China, six of the mountains of India, eight of south Europe, five of the east and nine of the west coasts of North America. (See HORTICULTURE.)

The white lily, *L. candidum*, was one of the commonest garden flowers of antiquity, appearing in the poets from Homer downward side by side with the rose and the violet. According to Hehn, roses and lilies entered Greece from the east by way of Phrygia, Thrace, and Macedonia. Mythologically the white lily, *Rosa Junonis*, was fabled to have sprung from the milk of Hera. As the plant of purity it was contrasted with the rose of Aphrodite. The lily of the Old Testament (*shôshan*) may be conjectured to be a red lily from the

simile in Cant. v. 13, unless the allusion is to the fragrance rather than to the color of the lips, in which case the white lily must be thought of. The "lilies of the field," Matt. vi. 28, are red lilies, and the comparison of their beauty with royal robes suggests their identification with the red Syrian lily of Pliny. Lilies, however, are not a conspicuous feature in the flora of Palestine, and the red anemone (*Anemone coronaria*), with which all the hillsides of Galilee are dotted in the spring, is perhaps more likely to have suggested the figure. In the Middle Ages the flower continued to be common, and was taken as the symbol of heavenly purity. The three golden lilies of France are said to have been originally three lance-heads.

LILYE, WILLIAM, one of the introducers of a knowledge of the Greek language into England, was born at Odiham about 1466, and died in 1523.

LIMA, capital of the republic of Peru, as also of the department and province of Lima, is situated on an extensive plain, 500 feet above the sea-level, and seven miles east from its port Callao on the Pacific coast. The general conformation of the main portion of the city, previous to 1870 surrounded by walls, is that of an irregular triangle, whose base rests on the river Rimac, which separates the city from its offshoot or suburb of San Lazaro. Sheltered on the north and east by the spurs of the Andes, the city is exposed to the winds prevailing from the southeast, as also to those from the south and west. Although the atmosphere is moist, and the transitions of the seasons are rapid, the climate is not unhealthy, the rainfall being slight, and the variations of temperature not excessive. The summer commences in December, and the winter in June, and the mean temperature for the year is about 73° Fahr. The city is divided into five quarters or parishes, and is well laid out with broad and regular thoroughfares, the streets intersecting one another at right angles. The houses are spacious, but generally of only two stories, and are approached by portals leading into an open court or yard. In the principal square, which covers an area of nine English acres in the center of the city, stands a fine fountain of bronze. Here also are the cathedral, a stone structure with two lofty towers and a broad façade, the archiepiscopal palace, the government house, and the Portal de los Escribanos, containing the municipal offices and archives. Besides the cathedral there are five chief parochial and sixty-two other churches and chapels, and numerous monasteries and convents. The university, built in 1576, is the oldest in America; it contains the hall and offices used by the chamber of deputies. Lima has more than seventy schools, a public library containing upward of 40,000 volumes, and many charitable institutions, several of them connected with the religious orders. The principal place of amusement is the amphitheater for bull-fights in the Plaza del Acho, accommodating 9,000 spectators. In the Plaza de la Exposicion is a marble statue of Columbus unveiling a figure of America. Of the many other monuments in Lima, the most famous is the bronze equestrian statue of Simon Bolivar in the Plaza de la Independencia (or de Bolivar), eleven tons in weight, commemorating the battle of Ayacucho, which secured the independence of Peru. As the capital of Peru, Lima is one of the most important trading centers in South America. It has, however, few home industries, its manufactured goods being chiefly imported from Europe via Callao, the medium of nearly all its foreign commerce. Several attempts have from time to time been made to establish factories, but the high price of labor has hitherto prevented any efforts on a large scale being permanently successful. In 1780 the population of Lima was

50,000; in 1860 it had reached 100,341, and a recent estimate gives the number at about 112,000.

Lima was founded January 18, 1535, by Francisco Pizarro, who named it *Ciudad de los Reyes* in honor of the emperor Charles V. Remaining under Spanish rule during the seventeenth, eighteenth and the early part of the nineteenth centuries, the city continued to increase in prosperity, though often visited by terrible earthquakes, of which the most disastrous was that of October 28, 1746, when 5,000 of the inhabitants perished and the port of Callao was destroyed (see CALLAO). On July 12, 1821, after a siege of some months, Lima was entered by a Chilean force under General San Martín, who on the 28th was proclaimed protector of Peru as a freestate, but its independence was not finally secured until after the victory of Ayacucho, December 9, 1824. In November, 1864, a congress of plenipotentiaries from Chili and other South American states was held here to concert measures of mutual defense. Of the various revolts which have during the last few years taken place at Lima may be mentioned that of November, 1865, when President Pezet was displaced for Canseco; the riots against religious toleration, April 15, 1867; and the military insurrection July 22, 1872, when Gutierrez, minister of war, arbitrarily assumed power, had President Balta imprisoned and shot, but himself soon fell a victim to the popular fury; order being afterward with difficulty restored by Vice-President Zavallos. In consequence of the ill-success of the war with Chili, Lima toward the close of 1879 was again in an unsettled condition; President Prado fled, and on December 22d, after a sanguinary coup d'état, Pierola was proclaimed dictator. In April, 1880, Callao was blockaded by Chilean war-ships, and Lima had to be placed in a state of defense. On the 20th of November the Chilean army effected a landing at Pisco, a fortified place about 100 miles south of Lima, and having afterward advanced upon the capital, forcibly occupied it upon January 17, 1881. (See CHILI, *ante*.)

LIMA, the capital of Allen county, Ohio, is situated on the Ottawa river, seventy miles from Toledo, at the crossing of several important railroads. It contains one national and three other banks, four newspaper offices, several hotels, a high school and two union schools, several steam mills and factories of steam-engines, furniture, railroad cars, etc. Population (1900), 21,723.

LIMBORCH, PHILIP VAN, a prominent Remonstrant theologian, was born at Amsterdam in 1663, and died in 1712.

LIMBURG, or LIMBOURG, one of the nine provinces of Belgium, is bounded on the north and east by Holland, on the south by the province of Liège, and on the west by those of Brabant and Antwerp; the area is 932 square miles, with a pop. (1901) of 240,796. The surface is for the most part flat, but rising somewhat toward the southeast. Most of the province is included in the barren and marshy district of sandy heath known as *La Campine* (Flem., *Kempen*). The Meuse, with a tolerably fertile valley, is its chief river. The soil is metalliferous; the chief vegetable products are cereals, leguminous plants, flax, hemp, and beetroot; and stockbreeding is largely carried on. Industries are less developed in Limburg than in the rest of Belgium; but the distilleries of the province are very considerable and noted. One of the most interesting towns of the province is ST. TROND (*q.v.*) thought to be the ancient *Atuaticum Oppidum*, the oldest town in Belgium. Near Tongres is a mineral well, described by Pliny.

LIMBURG, or LIMBOURG, one of the eleven provinces of Holland, is bounded on the west by Belgium (Limburg) and North Brabant, on the north by North Brabant and Guelderland, on the east by Rhenish Prus-

sia, and on the south by Belgium (Liège), and has an area of 851 square miles, with a pop. (1901) of 285,828 (97 per cent. being Roman Catholics).

LIMBURG, a town in the circle of Unterlahn and district of Wiesbaden, Prussia, is situated 360 feet above the sea-level, on the Lahn, here crossed by a bridge dating from 1315, and on the Nassau Railway, midway between Coblenz and Wetzlar. Population, 6,000.

LIMBUS. The *Limbus Infantum* or *Puerorum* in mediæval theology is the "margin" or "border" (limbus) of hell to which human beings dying without actual sin, but with their original sin unwashed away by baptism, were held to be consigned; the category included, not unbaptized infants merely, but also idiots, cretins, and the like. The word "limbus," in the theological application, occurs first in the *Summa* of Thomas Aquinas; for its extensive currency it is perhaps most indebted to the *Commedia* of Dante. The question as to the destiny of infants dying unbaptized presented itself to theologians at a comparatively early period, and received very various answers. Generally speaking, it may be said that the Greek fathers inclined to a cheerful and the Latin to a gloomy view. Thus Gregory of Nazianzus (*Orat.* 40) says "that such children as die unbaptized without their own fault shall neither be glorified nor punished by the righteous Judge, as having done no wickedness, though they die unbaptized, and as rather suffering loss than being the author of it." Similar opinions have been expressed by Gregory of Nyssa, Severus of Antioch, and others—opinions which it is almost impossible to distinguish from the Pelagian view that children dying unbaptized might be admitted to eternal life though not to the kingdom of God. In this recoil from Pelagian heresy, Augustine was compelled to sharpen the antithesis between the state of the saved and that of the lost, and taught that there are only two alternatives—to be with Christ or the devil, to be with Him or against Him. Following up, as he thought, his master's teaching, Fulgentius declared that it is to be believed as an indubitable truth that, "not only men who have come to the use of reason, but infants dying, whether in their mother's womb or after birth, without baptism in the name of the Father, Son, and Holy Ghost, are punished with everlasting punishment in eternal fire." Later theologians and schoolmen followed Augustine in rejecting the notion of any final position intermediate between heaven and hell, but otherwise inclined with practical unanimity to take the mildest possible view of the destiny of the irresponsible and unbaptized. The first authoritative declaration of the Latin Church upon this subject was that made by the second council of Lyons (1274), and confirmed by the council of Florence (1439), with the concurrence of the representatives of the Greek Church, to the effect that "the souls of those who die in mortal sin or in original sin only forthwith descend to hell, but to be punished with unequal punishment." In the council of Trent there was considerable difference of opinion as to what was implied in deprivation of the vision of God, and no definition was attempted, the Dominicans maintaining the severer view that the "limbus infantum" was a dark subterranean fireless chamber, while the Franciscans placed it in a lightsome locality above the earth. Some theologians continue to maintain with Bellarmine that the infants "in limbo" are affected with some degree of sadness on account of a felt privation; others, following Sfrondati, hold that they enjoy every kind of natural felicity, as regards their souls now, and as regards their bodies after the resurrection, just as if Adam had not sinned. In the condemnation (1794) of the synod of Pistoia (1786), the twenty-sixth article declares it to be false, rash, and injurious to treat as

Pelagian the doctrine that those dying in original sin are not punished with fire, as if that meant that there is an intermediate place, free from fault and punishment, between the kingdom of God and everlasting damnation.

The *Limbus Patrum*, *Limbus Inferni*, or *Sinus Abrahæ* is defined in Roman Catholic theology as the place in the underworld where the saints of the Old Testament were confined until liberated by Christ on his "descent into hell." Regarding the locality, and its pleasantness or painfulness, nothing has been taught as *de fide*, and opinions have been various.

LIME is the name of the strongly basic monoxide of the metal calcium. This base is widely diffused throughout the three kingdoms of nature in the form of salts, of which the carbonate and the hydrated sulphate are by far the most abundant. Both are found in the mineral kingdom in a variety of forms. Of native carbonates of lime, *calc-spar* (Iceland spar), though comparatively rare, may be mentioned first as representing the purest native form of the compound. It generally presents itself in the form of well-developed transparent colorless rhombohedra, which possess to a remarkable degree the property of producing double refraction of light, whereupon is founded its application in the construction of certain optical instruments. Of the varieties of massive or crystalline carbonate of lime, those which, through the fineness of their grain and other qualities, lend themselves for the purposes of the sculptor, go by the name of marble, while the remainder are embraced under the generic term of limestone. This name, however, is understood to exclude chalk, a soft, amorphous variety which, according to Ehrenberg, consists mainly of *Foraminifera* shells. All limestones contain at least traces of magnesia. When this foreign base is present in considerable proportion the rock is termed "dolomite" (see MAGNESIUM). Among the native forms of (hydrated) sulphate of lime the mineral "selenite" (glacies Mariæ) corresponds to Iceland spar among the carbonates. It forms colorless transparent clino-rhombic prisms, generally united into "twins," and flattened down to plates readily cleavable along planes parallel to the surface. Hardness ranges from 1.5 to 2; the specific gravity is 2.3. Far more common than selenite are the massive varieties known as ALABASTER and ordinary GYPSUM.

Both sulphate and carbonate of lime, apart from their occurrence as independent minerals, are almost universally diffused throughout the earth's crust, and in the waters of the ocean. Now the sulphate is appreciably soluble in even pure water, while the carbonate, though practically insoluble in pure, is decidedly soluble in carbonic acid water. As all atmospheric water must necessarily hold carbonic acid gas in absorption, most natural waters, and certainly all deep-well waters, are contaminated with more or less bicarbonate or sulphate of lime or with both. When such water is being boiled, there is an escape of the free and the loosely combined carbonic acid, and the carbonate of lime comes as a loose precipitate or as a "crust;" and when the water is sufficiently concentrated by evaporation, the sulphate likewise is partly deposited. The decomposition of the "bicarbonate" in fact takes place, though slowly, even at ordinary temperature, when the water in which it is held in solution is exposed to the atmosphere. It is in this manner that stalagmites and stalactites frequently seen within rock-caverns are produced, and there is no difficulty in accounting for the grotesque and fantastic forms which the latter often exhibit.

Quicklime.—The native carbonate always serves as the starting-point in the preparation of calcium compounds. From it the oxide known as quicklime or

caustic lime, is produced industrially by heating limestone or marble in kilns, between layers of fuel, which in the United States is generally coal. The carbonic acid goes away with the gaseous product of combustion, and the oxide remains in unfused lumps of the form of the original stones. Lime, when pure, is an amorphous white solid, which is absolutely infusible and non-volatile; and on this account, when raised to high temperatures, it emits a brilliant white light ("limelight"). The commercial article is generally gray or otherwise discolored by the presence of foreign metallic oxides.

Quicklime acts readily and energetically on water, with evolution of much heat, and formation of a bulky white powder of the hydrate. This powder readily mixes with water into a smooth paste, which may be diluted to a milky liquid—milk of lime. This, when filtered through paper, yields "limewater," a strongly alkaline liquid, containing about $\frac{7}{100}$ of its weight of lime. When boiled it deposits a part of its dissolved lime as such, and when exposed to ordinary air it quickly draws a skin of carbonate of lime. Hence its application as a reagent for carbonic acid, and the extensive use of milk of lime (whitewash) as a cheap white pigment in wall painting. Under the name of plaster, a fine, smooth paste of lime and sand, with short hair to increase the tenacity of the mixture, is a most important material for coating the internal walls and roofs of ordinary buildings.

Ordinary mortar, on account of the solubility of lime in water, is unfit for aquatic masonry; for this purpose hydraulic cements must be used. Of these there are a great variety, which, however, mostly agree in this, that they consist of calcined mixtures of limestone and clay (preferably alkaliferous clay), and other silicates. By calcining such mixtures at temperatures short of that at which a glass would be produced, the lime becomes caustic, and part of the caustic lime, by uniting with the clay (and silicate generally), forms a silicate sufficiently basic to be disintegrable by acids, and even by water. When such cement, as a powder, is mixed with water, the lime acts upon the silicate of alkali and the gelatinous silica-hydrate transitorily produced, and with the silica and alumina and oxide of iron unites into a hard, waterproof, very complex, silicate mixture.

Lime, being the cheapest of powerful bases, is largely used in chemical manufacturing. It serves for the causticizing of soda, for the preparation of ammonia from ammonia salts, and for the manufacture of bleaching powder. It also enters into the composition of certain kinds of glass, and is used (as lime or as carbonate), in the making of soda ash.

LIME, or LINDEN. The lime-trees, species of *Tilia*, are familiar timber-trees with mellifluous flowers, rarely if ever maturing their fruit in England, which are borne on a common peduncle proceeding from the middle of a long bract. *T. europæa*, L., is indigenous to Europe, excepting the extreme north, and extends eastward across Russian Asia to the Altai. The lime is much planted in Britain, and is probably wild in south and west England, and perhaps in Ireland. The truly indigenous form in north Europe is always a small-leaved one. The large-leaved variety is of South-European origin. The lime sometimes acquires a great size: one is recorded in Norfolk as being sixteen yards in circumference, and Ray mentions one of the same girth. The famous linden-tree which gave the town of Neustadt in Würtemberg the name of "Neustadt an der grossen Linden" was nine feet in diameter.

The economic value of the tree chiefly lies in the inner bark or liber, called bast, and the wood. The former was used for paper and mats and for tying gar-

lands by the ancients. The wood is used by carvers, being soft and light, and by architects in framing the models of buildings. Turners use it for light bowls, etc. The flowers, alone, are used for an infusion in Austria and elsewhere, with much success in vertigo and spasms, producing perspiration, and alleviating coughs; but the bracts and fruit are astringent.

LIMERICK, a maritime county of Ireland, in the province of Munster, is bounded on the north by the estuary of the Shannon and the counties of Clare and Tipperary, on the east by Tipperary, on the south by Cork, and on the west by Kerry. Its greatest length from north to south is thirty-five miles, and its greatest breadth east and west fifty-four miles. The total area comprises 662,973 acres, or 1,064 square miles.

The greater part of the county is comparatively level, and rests on limestone, but in the southeast the picturesque Galtees, which extend into Tipperary, and are composed of Silurian strata overlaid by Old Red Sandstone, attain in Galtymore a height of 3,015 feet, and on the west stretching into Kerry there is a circular amphitheater of less elevated mountains composed of volcanic rocks. The Shannon is navigable to Limerick, above which are the rapids of Doonas and Castleroy. The Maig, which rises in the Galtees, and flows into the Shannon, is navigable as far as the town of Adare. Limerick includes the greater part of the Golden Vale, the most fertile district of Ireland, which stretches across the center of the county from Cashel in Tipperary to near the town of Limerick. Along the banks of the Shannon there are large tracts of flat meadow land formed of deposits of calcareous and peaty matter, and possessing extraordinary fertility. The soil in the mountainous districts is, for the most part, thin and poor, and incapable of improvement. In 1880 there were 176,774 acres under tillage, 415,107 pasture, 8,407 plantations, and 62,465 waste.

The inhabitants are employed chiefly in agriculture, but coarse woolens are manufactured, and also paper, and there are a considerable number of meal and flour mills. Population 146,018 in 1901.

LIMERICK, a county of a city, parliamentary borough, and the chief town of the county of Limerick, is situated on both sides of the Shannon at the head of its estuary, and on an island of the river, 120 miles west-southwest of Dublin by rail. The population in 1851 was 48,961, which in 1871 had increased to 48,980, but in 1901 had diminished to 45,806.

Limerick is said to have been the ancient *Regia* of Ptolemy and the *Rosse-de-Nailleagh* of the Annals of Multifernan. There is a tradition that it was visited by St. Patrick in the fifth century, but it is first authentically known as a settlement of the Danes, who in the middle of the ninth century made it one of their principal towns, but were expelled from it in the eleventh century by Brian Boromhe. The city was frequently besieged in the thirteenth and fourteenth centuries. In the fifteenth century its fortifications were extended to include Irish Town, and until their demolition in 1760 it was one of the strongest fortresses in the kingdom. In 1651 it was taken by General Ireton, and after an unsuccessful siege by William III. in 1690 its resistance was terminated in October of the following year by the treaty of Limerick. The town first obtained municipal privileges in 1199, and these were confirmed and extended by Edward I. and other sovereigns. In 1609 it received a charter constituting it a county of a city, and also incorporating a society of merchants of the staple, with the same privileges as the merchants of the staple of Dublin and Waterford.

LIMITATIONS, STATUTES OF, are laws by which rights of action are limited to a fixed period after the oc-

currence of the events giving rise to the cause of action. This is one of the devices by which lapse of time is employed to settle disputed claims. There are mainly two modes by which this may be effected. We may say that the active enjoyment of a right—or possession—for a determined period, shall be a good title against all the world. That is the method generally known as PRESCRIPTION, (*q.v.*) It looks to the length of time during which the defendant in a disputed claim has been in possession or enjoyment of the matter in dispute. On the other hand, the principle of the statutes of limitation is to look to the time during which the plaintiff has been out of possession. The point of time at which he might first have brought his action having been ascertained, the lapse of the limited period after that time bars him forever from bringing his action. In both cases the policy of the law is expressed by the maxim *Interest reipublicæ ut sit finis litium*.

The principle of the statute of limitations has passed, with some modification, into the statute-books of every State in the Union, except Louisiana, whose laws of limitation are essentially the prescriptions of the civil law drawn from the *Partidas*, or "Spanish Code." As to personal actions, it is generally provided that they shall be brought within a certain specified time—usually six years or less—from the time when the cause of action accrues, and not after, while for land the "general if not universal limitation of the right to bring action or to make entry is to twenty years after the right to enter or to bring the action accrues." The constitutional provision prohibiting States from passing laws impairing the obligation of contracts is not infringed by a law of limitations, unless it bars a right of action already accrued without giving a reasonable term within which to bring the action.

LIMOGES, capital of the department of Haute Vienne, France, and the ancient capital of Limousin, lies in the form of an amphitheater on the right bank of the Vienne, 248 miles by rail south-southwest from Paris, on the Paris and Toulouse Railway, at its junction with the Charente line. It has also direct railway communication via Bellac with Poitiers. The population (1901) was 83,569. In spite of modern improvements and clearances, commencing with the administration of Turgot in 1762, the city still contains old quarters, which are dark, wretched, and unhealthy.

The cathedral, the most remarkable building, not only in the town but in the province, is in the Parisian Ogival style, and occupies the site of an old heathen basilica, which, according to tradition, was transformed into a Christian church by St. Martial. The present edifice was built between 1273 and 1327, and has been recently restored, the north front of the transept, distinguished by the richness and perfection of its details, having been finally completed in 1851. The campanile is an elegant slightly leaning tower, 204 feet high. The interior of the church is remarkable for the boldness and elegance of its construction. It has a magnificent rood-loft, attributed to Bishop Jean de Langeac (1533); close by the choir screen is the mausoleum of the same prelate. The glass was repaired in the sixteenth century, but is still undergoing restoration. Under the choir is the crypt of the old Roman church, containing frescoes of the eleventh century. Limoges is the headquarters of the twelfth army corps, and is also the seat of several learned societies, and of a court of appeal.

The principal industry is the manufacture of porcelain. There is an extensive trade in wine and spirits, cattle, cereals, and wood. Limoges was a place of importance even at the time of the Roman conquest, and sent 10,000 soldiers to the defense of Alesia.

LINACRE, or LYNAKER, THOMAS, a distinguished

humanist and physician, was born at Canterbury about the year 1460. Of his parentage or descent nothing certain is known. Linacre entered the university of Oxford about the year 1480, and in 1484 was elected a fellow of All Souls' College. Shortly afterward he visited Italy in the train of William of Selling, who was sent by Henry VIII. as an envoy to the papal court, and accompanied his patron as far as Bologna. There he became the pupil of Angelo Poliziano, and afterward shared the instruction which that great scholar imparted at Florence to the youthful sons of Lorenzo de' Medici. The younger of these princes became Pope Leo X., and was in after years mindful of his old companionship.

Linacre took the degree of doctor of medicine with great distinction at Padua. On his return to Oxford, full of learning and imbued with the spirit of the Italian Renaissance, he formed one of the brilliant circle of Oxford scholars, including Colet, Grocyn, and William Latimer, who are mentioned with so much warm eulogy in the letters of Erasmus.

Linacre does not seem to have practiced or taught medicine at Oxford. About the year 1501 he was called to court as tutor of the young Prince Arthur, and continued to act in this capacity till the prince's death in 1503. On the accession of Henry VIII. he was appointed the king's physician, an office at that time of considerable influence and importance, and practiced medicine in London, having among his patients most of the great statesmen and prelates of the time, as Wolsey, Warham, and Fox.

After some years of professional activity, and when in advanced life, Linacre received priest's orders. Literary labors and the cares of the foundation which owed its existence chiefly to him, the Royal College of Physicians, occupied Linacre's remaining years till his death in 1524.

LINARES, an important mining town in the province of Jaen, Spain, is situated in an arid plain, near the foot of the Sierra Morena, 24 miles N.N.E. from the town of Jaen, 12 northeast from that of Baeza, and half an hour by rail from the Vadollano station of the Madrid and Cordova line. Pop. (1898), 35,233.

LINCOLN, one of the four eastern maritime counties of England. It is bounded on the north by the Humber, east by the German Ocean and the Wash, southeast for three miles by Norfolk, south by Cambridge and Northampton, southwest by Rutland, west by Leicestershire and Notts, and northwest by Yorkshire. Its greatest length north and south, from Barton-on-Humber to Market Deeping, is seventy-five miles; its greatest breadth, from Wroot on the west to Saltfleet on the east, is fifty miles, its circuit about 260 miles. Its area is 1,659,647 acres, or about 2,740 square miles, making it the second largest county in England.

The coast-line, about 110 miles in length, is low and marshy, and artificial banks for guarding against the inroads of the sea are to be found, in places, all along the coast. From Grimsby to Skegness traces of submarine forest are visible; but while the sea is encroaching upon some parts of the coast it is receding from others, as shown by Holbeach, which is now six miles from the sea. Several thousand acres have been reclaimed from this part of the Wash, and round the mouth of the Nene on the southeast. The deep bay between the coasts of Lincolnshire and Norfolk, called the Wash, is full of dangerous sandbanks and silt; the navigable portion, off the Lincolnshire coast, is known as the Boston deeps. The rapidity of the tides in this inlet, and the lowness of its shores, which are generally indistinct on account of mist from a moderate offing, render this the most difficult portion of the navigation of the east coast of England.

The surface of Lincolnshire is generally a large plain, some portions of which are below the level of the sea. Pop. (1001), 492,948.

The general appearance of the county is very pleasing. The level tracts are richly cultivated; the hills and dales are interspersed with wood and lawn; and many spots on the Cliff or Wolds command extensive and charming views.

According to the agricultural returns for 1881, the total area under crops comprehended 1,498,676 acres.

The agriculture of Lincolnshire is only second to that of East Lothian, by which alone it is excelled in the use of fixed steam-engines upon its farmsteads.

Administration.—The primary divisions of Lincolnshire are three trithings or ridings. The north division constitutes the Parts of Lindsey, the southwest the Parts of Kesteven, and the southeast the Parts of Holland. Each of these divisions had before the Norman Conquest its own trithling grefa or reeve, and to this day each has its separate magistrates, quarter sessions, clerk of the peace, and treasurer, but they are all under one lord-lieutenant and one sheriff, and subject to the court of assize held at Lincoln. These "Parts" are again subdivided into wapentakes, soke, and hundreds. The trithings do not in any way coincide with parliamentary divisions. The Parts of Lindsey comprise more than half the county, and contain seventeen wapentakes. The Parts of Kesteven, exclusive of the soke and borough of Grantham and the borough of Stamford, comprise nine wapentakes. The Parts of Holland comprise three wapentakes only. Before the passing of the Reform Act of 1832 Lincolnshire sent twelve members to parliament—two for the county, two for the city of Lincoln, and two each for the boroughs of Great Grimsby, Boston, Grantham, and Stamford. After the passing of that act the county returned four members, and Grimsby lost one. In 1867 Stamford also lost a member, and the representation of the county, newly divided into Mid, North, and South Lincolnshire, was increased to six, each new division returning two members. Lincolnshire comprises one city, Lincoln (pop. [1901], 48,784), which is also a municipal and parliamentary borough; four other municipal and parliamentary boroughs—Boston (18,867), Grantham (17,345), Great Grimsby (63,138), Stamford, partly in Northampton (8,995); and one municipal borough—Louth (10,690).

The county belongs to the midland circuit. Besides the winter and summer assizes held at Lincoln, there are spring assizes held at the same place for Lincoln and Notts, and autumn assizes at Nottingham for Notts and Lincoln. Quarter sessions for the Parts of Lindsey are held at Lincoln and Spilsby, for the Parts of Kesteven at Bourn and Sleaford, for the Parts of Holland at Boston and Spalding. The county is divided into seventeen county court districts, many of which coincide with the unions. For the convenience of rating there are eighteen poor-law unions; five of these, however, include eighty parishes in the adjacent counties. Ecclesiastically the county, with that of Nottingham, forms the diocese of Lincoln, which is divided into the three arch-deaconries of Lincoln, Stow, and Nottingham, the latter place giving title to a suffragan bishop without a see.

In 1881 the population of the county was 469,994 (235,014 males and 234,980 females).

History and Antiquities.—It is highly probable that the territory now forming Lincolnshire was first settled by a tribe of the Belge, who, however, at the time of the invasion by Cæsar, had become a mixed race with the real Britons. This territory was unaffected by Cæsar's first invasion, and even after the reduction of Britain by Claudius the Fenland remained intact. The

county was conquered about 70 A.D., and formed part of the province of Flavia Caesariensis. The tribes which occupied Lincolnshire, according to Ptolemy, were the Coritani, who had Lindum and Katæ (Leicester) for their towns. The date of the introduction of Christianity is uncertain, but we learn from Bede (*Hist. Eccles.*, ii. 16) that Adelphius of Colonia Londinensium, which has been mistaken for London, attended the council of Arles (314). Under the Saxon kingdom of Mercia, Lindsey, which probably extended nearly or quite over the modern county of Lincoln, appears to have been a dependent state. Under Edwin of Northumbria, the conqueror of Mercia, Christianity was reintroduced by Paulinus of York, and Bede tells us that Blæcca, the governor of Lincoln, was, with his household, among the first converts (628).

Early in 870 the Danes or Northmen landed at Humberstone, near Grimsby, and ravaged Lindsey and the famous monastery of Bardney on the Witham. Lincolnshire passed permanently into the hands of the Danes about 877, and was included within the boundary of the "Danelage" of Danish jurisdiction as settled by the treaty of 878. Probably the greatest changes consequent upon the Danish invasion are, first, the supplanting of the Anglo-Saxon names of places by those of the Danish termination ending in *by*, which are numerous, and the substitution of the wapentake for the earlier division of the hundred; the ancient British laws and those of the Danes were otherwise not dissimilar. In time the two populations became amalgamated and came under the dominion of the Anglo-Saxon crown. The subsequent history of the county under the Normans is associated more or less with the city of Lincoln. In the civil war between Stephen and the empress Matilda a battle was fought near Lincoln in 1141. In 1174 the Isle of Axholme was the scene of the struggle between Roger de Mowbray, one of the adherents of Prince Henry, and the forces sent against him by his father Henry II. The issue was decided by the Lincolnshire men in favor of the king. In 1216 occurred King John's march across the county, when he lost all his baggage and jewels in the Fossdyke Wash on his way to Swineshead Abbey. In the reign of Edward IV. Sir Robert Wells, at the head of 30,000 Lincolnshire men, was defeated at Losecoat Field near Stamford, March, 1470. At the suppression of the monasteries a rebellion broke out at Louth headed by Makerel, the last prior of the abbey of Barlings Oxney, October, 1536. The prior was hanged, and the shire for the trouble it gave to King Henry VIII. was designated in a state paper as "one of the most brute and beestalie of the whole realm." During the civil wars the county was a scene of numerous contests, the most famous of which was the battle at Grantham in 1643, won by Cromwell over the royalists. The advantage that was taken by the Fenmen to destroy the efforts made to drain and inclose the remaining levels of Lincolnshire during this stormy period has been already noticed. Riots broke out at intervals, and were continued down to the middle of the eighteenth century.

Remains of British camps are found at Barrow, Folkingham, Ingoldsby, Revesby, and Well. Traces of Roman camps are found at Alkborough, Caistor, Gainsborough, Gedney Hill near Holbeach, Honington near Grantham, South Ormsby, and Yarborough. The Roman roads are nearly perfect—Ermine Street, on the east side of the Cliff hills, and the Fossway running southwest from Lincoln. The crown of these remains is without doubt the famous Roman arch called the Newport Gate at Lincoln. Tesselated pavements have been found at Denton, Horkstow, Lincoln, Scampton, and Winterton. Coins of the emperors Nero, Vespasian,

and Julian have been found at Lincoln and Ancaster, and two Roman altars to the west of Stow.

There are remains of feudal castles at Boston, Lincoln, Sleaford, Somerton, Tattershall, and Torksey. The seats worthy of note (chiefly modern) are Appleby Hall, Aswarby Hall, Belton House, Blankney Hall, Brocklesby, Bulby House, Burghley House (near Stamford), Burton Hall, Casewick House, Denton Hall, Easton Hall, Hackthorn Hall, Haverholm Priory, Lea Hall, Leadenham House, Manby Hall, Newton House, Nocton Hall, Normanby Hall, Norton Place, Panton Hall, Riby Grove, Somerby Park, Stourton, Syston Park, Thonock House, Thurlby Hall, Uffington, and Willingham by Stow.

At the time of the suppression of the monasteries in the reign of Henry VIII. there were upward of one hundred religious houses; and among the Fens rose some of the finest abbeys held by the Benedictines. The Gilbertines were a purely English order which took its rise in Lincolnshire, the canons following the Austin rule, the nuns and lay brothers that of the Cistercians. They generally lived in separate houses, but formed a community having a common church in which the sexes were divided by a longitudinal wall. These houses were at Alvingham, Catley, Holland, Brigg, Lincoln, before the gate of which was erected the first Eleanor Cross, Newstead in Lindsey, Semperingham, the chief house of the order, founded by St. Gilbert of Gaunt in 1139, Stamford (a college for students), and Welles. There were nunneries of the order at Haverholm, Nun Ormsby, and Tunstal.

The following are a few of the most famous abbeys:— (1) Barlings Oxney (Premonstratensian), founded 1154, for fourteen canons. The tower, decorated, with arcading pierced with windows, and the east wall of the south wing remain. (2) The Benedictine Mitred Abbey of Crowland, founded 716, refounded in 948. The foundations of the new church in 1114 were laid on massive piles of oak. Part of the west front was repaired in 1255–81, with beautiful Early English sculpture of the legend of St. Guthlac and saints; this, with the Perpendicular northwest tower, 1460–70, remain. (3) Swineshead Abbey (Carthusian), colonized from Furness in 1134 by eleven monks. (4) Thornton-upon-Humber Abbey (Black Canons), founded in 1139. There remain a fragment of the south wing of the transept, two sides of the decagonal chapter-house (1282), and the beautiful west gatehouse, Early Perpendicular (1382–88), with an oriel window on the east.

The general beauty of the parish churches of Lincolnshire is proverbial, but it is incorrect to suppose that they are equally good in every part of the county. In the Parts of Lindsey, though there are some of considerable beauty and interest, the churches can scarcely be considered above the average; several though small and mean present curious early features, particularly the well-known tower of St. Peter, Barton-on-Humber, supposed to be of the Saxon period, and those of Crowle, Heapham, and Stow. Those of Grimsby and Wainfleet are cruciform.

In the Parts of Kesteven the churches are not only elegant but well finished, built of excellent stone which abounds at Ancaster and near Sleaford. The church of St. Andrew Heckington is the best example of Middle Pointed architecture in the county; it is famed for its Easter sepulcher and fine sedilia. The largest and finest church in this division is doubtless that of St. Wolfran, at Grantham, 200 by 87 feet, with three collateral naves, and steeple, 271 feet high, of the fourteenth century.

It is principally in the Parts of Holland that we are to look for the finest churches in the county; they are

not to be equaled by those of any other district in the kingdom, which is the more remarkable as the district is composed wholly of marsh land, and is without stone of any kind. It is highly probable that the churches of the south part of this district owe their origin to the munificence of the abbeyes of Crowland and Spalding.

LINCOLN, the capital of the county of that name, is a city and county in itself, and is also a municipal and parliamentary borough. It is picturesquely situated on the summit and south slope of the limestone ridge of the Cliff range of hills which rises from the north bank of the River Witham, at its confluence with the Foss Dyke, to an altitude of 200 feet above the river. It is 132 miles northwest from London by road, and 138 miles by rail. Lincoln is one of the most interesting and ancient cities in England. Pop. 48,784.

LINCOLN, a town of Providence county, R.I., with a population by the last United States census of 8,937, is made up of Manville, Central Falls, Albion, Lonsdale, and other villages. All of these are actively engaged in manufactures, and the town has grown rapidly, its population having almost doubled in the decade 1880-90.

LINCOLN, a city of the United States, capital of Logan county, Ill., is situated near Salt Creek, at the junction of three railways, 145 miles southwest of Chicago. It has churches, banks, a high school, a telephone exchange, a coal-mine, foundries, flour-mills, newspapers, and grain elevators. It is the seat of Lincoln university (Cumberland Presbyterian) and of the State asylum for feeble-minded youth. A portion of the town dates from 1835, but the newer part was named in honor of Abraham Lincoln, and was incorporated in 1853. Population (1900), 8,962.

LINCOLN, a city of the United States, county seat of Lancaster county, Neb., and capital of the State. It is pleasantly situated about fifty miles west of the Missouri river, at the junction of several railroads, in the midst of a highly fertile and healthful region of undulating prairie, and near rich salt springs. Lincoln is the seat of the following State institutions:—University, State prison, insane asylum, and home for the friendless. The prison and the asylum grounds, occupying several hundred acres, are three miles from the center of the city, and two miles from each other. The United States Government has a massive building for collection of revenue, United States courts, and postoffice. With its broad streets, its public park, and the State-house and other grounds, the healthful ventilation of Lincoln is amply provided for. It has daily papers, banks, one of the largest printing and publishing houses west of the Mississippi, and several prosperous wholesale stores. Although but twenty-three years old, it has a population (1900 census) of 40,169.

*LINCOLN, ABRAHAM, who shares with Washington the distinction of supreme fame in American history, came from that old English Quaker stock which contributed so many other men of worth to the making and upbuilding of this Republic. The family name is a common one in New England, and it is not improbable that all the Lincolns in America in colonial days were more or less closely related. The earliest known ancestors of Abraham Lincoln in America, however, were settled in Bucks county, Pennsylvania, whence they removed to Virginia. In ante-Revolutionary days Abraham Lincoln, the paternal grandfather of the President, removed from Virginia to Kentucky, where he was a comrade of his brother-in-law Daniel Boone. There

he was killed by the Indians. He left a son, named Thomas Lincoln, who grew up in the Kentucky frontier country and was all his life a poor and obscure man. Thomas Lincoln married Nancy Hanks, a woman of Virginian parentage, who also belonged to a poor and humble family. To them was born, on February 12, 1809, a son to whom they gave the name of Abraham, after his grandfather, and who became the sixteenth President of the United States, the emancipator of the negro race in America, and the savior of the United States from dissolution. On that same day Charles Darwin was born, and in the same year Gladstone, Tennyson and a number of other illustrious men saw the light; but we may well doubt if any of them merits a higher place in the history of the world and in the affection and honor of the human race, than this offspring of struggling Kentucky pioneers, born in a log cabin in the western wilderness.

Lincoln was born at Nolin's Creek, near Hodgenville, in Hardin (now Larue) County, Kentucky. At six and seven years of age he went for a short time to a backwoods school, where his only text-book was a second-hand copy of "Dilworth's Spelling Book," and where he learned little more than to read and write. When he was eight years old he was taken by his parents to Indiana, to escape the blight of slavery. Thomas Lincoln realized that in a State where negro slavery prevailed, as it did in Kentucky, while the well-to-do white man might grow rich, there was no hope for the poor white man but to sink to a level below even that of the slaves—as witness the condition of the "poor white trash" of the Southern States. He did not propose to suffer such fate without a struggle; so he packed up his few belongings and set out for the country north of the Ohio river, which under the Ordinance of 1787 was forever to be a free country. He crossed the river on a rude raft of logs, and made his way to Little Pigeon Creek, near Gentryville, in Spencer County, Indiana. At that time that was an unbroken wilderness, far more primitive than Kentucky, and it is told that Thomas Lincoln literally had to cut a road with his axe through the forest to reach the spot where he made his home. His little log cabin of two rooms was several miles from any other human habitation. In that place the future President could go to no school. There was none within many miles. But his mother, a woman of fine mind and pious soul, taught him what she could, and added to his lessons the simple religious training that marked all his after life. Two years after the removal to Indiana, however, she died, and the boy was left to the companionship of his hard-working father. A year later the father married again, his second wife being a widow, Mrs. Sarah Johnston (born Bush), of Kentucky. Happily, she proved to be a true mother to her stepson, giving him a wealth of affection, together with all possible instruction and right guidance. A couple of years later a neighboring settler, named Crawford, opened a school in his own cabin, and young Lincoln attended it for some time. There he studied arithmetic and other primary branches, his studies making up in thoroughness what they lacked

in scope and variety. He also read a number of books which profoundly influenced his mind for life. These were Bunyan's "Pilgrim's Progress," Æsop's "Fables," a life of Washington, and some others. Books were scarce in that country in those days, and such as were obtainable were read and reread many times. The traces of his readings of Bunyan's matchless work are evident in all of Lincoln's speeches and letters.

When he was nineteen years old, in 1828, Lincoln made his first considerable journey. He went to New Orleans on a flatboat on the Mississippi river, in company with the son of the owner of the boat, a youth of his own age. The two were entrusted by the owner not only with the boat but also with a valuable cargo. On the way down they were attacked by a gang of robbers, whom they succeeded in beating off, and then made the rest of the trip in safety. Two years later Lincoln assisted his father to make another removal of his home, this time to Decatur, Illinois, and himself built a rail fence around the new homestead, from which circumstance came the name of "The Rail-Splitter," by which he was afterward known. For two years he lived there, working on the farm, hunting, and serving as clerk in a country store. He also built a flat-boat for use on the Sangamon river, and himself navigated it. On one trip the boat got stuck upon a bar in the river, and Lincoln devised an ingenious mechanical arrangement for lifting it over the obstruction, upon which he afterward obtained a patent. With this boat he made another trip to New Orleans, and there, seeing some slaves grossly ill-treated, was confirmed in the hatred of slavery which he had inherited from his father. When the Black Hawk Indian war broke out in 1832, he promptly enlisted in the army, and was made a Captain of volunteers, but his active service was confined to marching, no real fighting falling to his lot. After the war he was a candidate for the Illinois Legislature, and polled a large vote, but was defeated. He then settled at New Salem, on the Sangamon river, and was a grocer, surveyor and postmaster. He also was pilot of the first steamboat on the Sangamon. He studied law, maintained his interest in politics, and became known as an effective "stump" speaker. In 1834 he was elected to the State Legislature of Illinois, and there showed himself a forcible debater. Finally, in 1836, he was admitted to practice at the bar, and removed to Springfield, the State capital, where he opened a law office, at the same time keeping a close watch upon the progress of political affairs. His law partner was John T. Stuart, and the firm soon became well known, while Lincoln won a fine personal reputation, especially as a pleader, in both civil and criminal cases.

He was urged to accept a nomination for the Legislature in 1840, but declined it in favor of a nomination for Presidential Elector on the Whig ticket. He was again a candidate for Elector in 1844, and in that year canvassed Illinois in support of Henry Clay, of whom he was a warm admirer. Already, it is to be noted, he had outgrown mere State politics, and aspired to a place in National affairs. His ambition was gratified in 1846, in his election as a Representative in Congress. At Wash-

ington he made no attempt to distinguish himself as a speaker, but he conspicuously committed himself in favor of receiving anti-slavery petitions, in favor of the abolition of slavery in the District of Columbia, in favor of the Wilmot Proviso, and in earnest opposition to the Mexican war. On these and other questions he acted sometimes with his party, but sometimes with entire independence. His Congressional term of office lasted from 1847 to 1849, and during that time he was actively interested in National politics. He was a member of the National Whig Convention which nominated General Taylor for the Presidency, in 1848, and he canvassed Illinois upon the stump in favor of Taylor's election. The following year he was a candidate for the United States Senatorship from Illinois, but was defeated, the Democrats securing a majority of each house of the Legislature. Then, at the expiration of his term in Congress, he retired for a time from politics and devoted himself to the practice of his profession. Amid his law work, however, he kept a close watch upon the progress of National politics, and held himself in instant readiness to re-enter the arena whenever opportunity should seem favorable.

The opportunity came in 1854. That was, indeed, the year which marked the turning point in American political affairs. In May the infamous Nebraska bill was enacted, and the Missouri Compromise was repealed. Thus the way was prepared for Civil war in Kansas. More than that, the eyes of the free State men of the North were opened to the necessity of resisting the aggressions of the Slave power. Hitherto Illinois, though a free State, had been strongly Democratic and had supported proslavery policies. The doings of 1854 revolutionized it and made it anti-Democratic. Lincoln promptly recognized his opportunity, closed his law books, and threw himself into the forefront of the political fight. The author of the Nebraska bill and of the repeal of the Missouri Compromise, was Stephen A. Douglas, who had been Lincoln's colleague and political opponent in the Illinois Legislature years before, and who now was a United States Senator, the Democratic leader of Illinois, and a probable candidate for the Presidency. Lincoln entered the campaign to carry the State Legislature for the Whigs, and thus to give Douglas a Whig Senator for his colleague. In that the Whigs were successful. They carried the Legislature, and for a time were divided in counsel, whether to elect Lincoln or Lyman Trumbull to the United States Senate. The dispute was ended by Lincoln himself, who already had his eye on a more important place than the Senatorship. With equal tact and generosity he withdrew from the contest, and persuaded his friends to vote for Trumbull, who was thus elected. Trumbull was Senator, but Lincoln was the popular leader of the Whig party in Illinois. But the Whig party was rapidly going to pieces. Lincoln did not seek to prevent but rather hastened the process, and upon its ruins the Republican party was founded. In 1856 the first National Convention of the new party was held. Lincoln was the candidate of the Illinois delegation for the Vice-Presidency, and received 110 votes in the Convention for that nomina-

tion. He might have been nominated had it not been considered wise to select an eastern man to go on the ticket with Fremont, in order to make the strongest possible appeal to all parts of the country; so Dayton, of New Jersey, was chosen instead.

Lincoln was not disappointed. Indeed it is doubtful if he really desired the Vice-Presidential nomination. He took an active part in the campaign, and was first on the list of Presidential Electors from Illinois. Two years later another Senatorial campaign came on. Douglas's term was to expire in 1859, and the Legislature chosen in 1858 would elect his successor. It was customary in those days for the State Convention to select a Senatorial candidate, whom the Legislature would elect if that party was victorious at the polls. The Republican State Convention, in June, 1858, thus selected Lincoln as its candidate for Douglas's seat in the Senate. The Democrats, of course, chose Douglas, the "Little Giant," as a candidate to succeed himself. In accordance with custom, also, the two candidates went upon the stump and canvassed the State. The question of slavery and its extension was the dominant one in the campaign. Douglas was the champion of "squatter sovereignty" and had to bear the burden of the Nebraska bill and the repeal of the Missouri Compromise. Lincoln sounded the keynote of his side in his speech accepting the nomination, when, following his frequent habit of quoting Scripture, he declared that the Union could not permanently remain half slave and half free, for "a house divided against itself cannot stand." Douglas spoke at Chicago on July 9, and Lincoln followed him there the next day. A week afterward both spoke on the same day at Springfield. Then, on July 24, Lincoln challenged Douglas to a series of public debates. Douglas accepted, insisting, however, that he should both open and close each debate, thus having four speeches to Lincoln's three, an advantage which Lincoln unhesitatingly gave him.

In this historic contest each had an opponent worthy of him. Douglas, then at the height of his splendid powers, was by far the more cultivated and highly educated, and was by far the better known to the nation at large. He had, moreover, a marvelous gift for putting himself in touch with the people, and appealing to their hopes and fears, their passions and prejudices. Lincoln, on the other hand, had a mastery of logic and of epigram such as few orators in any land or time have had. Moreover, he had a strategic ability that was simply unrivaled. The two met in debate seven times, in various parts of the State, between August 21 and October 15. The debates were fully reported, and were followed with absorbing interest by the whole country. The general verdict was that Lincoln had the better of them. The result at the polls was that the Republicans carried the State by 5,000 majority, though the unequal apportionment of seats gave the Democrats control of the Legislature and Douglas was re-elected to the Senate. That result was, however, not a disappointment to Lincoln. On the contrary, it was foreseen and expected by him. Indeed, he actually courted it. In his opening debate he demanded of

Douglas an answer to the question: "Can the people of a Territory, in a lawful way, against the wish of any citizen of the United States, exclude Slavery from that Territory, prior to its adoption of a State Constitution?" His friends tried to dissuade him from putting this question. Douglas, they said, would answer it in the affirmative, and thus please the people of Illinois, and win the election. Lincoln replied that that was just what he wanted. He was aiming at bigger game than the Senatorship. He saw that Douglas would be the most formidable Democratic candidate for the Presidency in 1860. But to be elected President, Douglas must carry Illinois and must also have the support of the Slave States. But the question Lincoln proposed to ask him would put him in a dilemma. If he answered it in the negative, he would offend the free soil sentiment of Illinois and lose not only the Senatorship but also the support of his own State for the Presidency, which latter would be fatal to him. On the other hand, if he answered it in the affirmative, as Lincoln assumed he would, he might win the favor of Illinois and retain the Senatorship, but he would certainly offend the Slave States and forfeit their support for the Presidency. It was a shrewd device, and it was successful. Lincoln put the fatal question to Douglas, at Freeport. Douglas unhesitatingly answered it in the affirmative. That gave Douglas the Senatorship. But it lost him the Presidency two years later, for the Southern States refused to support him, and split the Democratic party asunder.

Having thus compassed the destruction of his great rival's Presidential prospects, Lincoln set about assuring his own, by making the country outside of Illinois acquainted with him. He visited New York and New England, and also went as far west as Kansas, during 1859, making many speeches and producing a profound impression. His speech in New York was accepted as the most authoritative exposition thus far made of the principles and policy of the new Republican party, and it served as a text book for innumerable other speakers in the campaign of 1860. He made another notable speech at Cincinnati, in the spring of 1860, to an audience composed chiefly of Kentuckians. These men he addressed as a fellow Kentuckian, who had been driven out of that State by the evils of the slave system. In May, 1860, the Republican National Convention met in Chicago. There were numerous candidates for the Presidency, but the contest soon centered around two, Lincoln, and William H. Seward of New York. Upon the third ballot Lincoln was nominated, receiving 354 out of 465 votes. Thereupon William M. Evarts, the leader of the Seward forces, moved that Lincoln's nomination be made unanimous. This was done, and a few days later Lincoln accepted the nomination in a particularly graceful and inspiring letter. The Democratic party, meantime, was split asunder, as Lincoln had planned it should be. The progressive wing of the party at the regular National Convention nominated Douglas. The extreme pro-slavery men at a seceding convention put Breckinridge forward. Also the remnant of the old Whig party, which had not yet been absorbed by the Republicans, nominated Bell as a "Constitutional Union"

candidate. The campaign was exceptionally earnest, the whole nation apparently realizing the tremendous issues at stake. On November 6 the election occurred. Lincoln received a popular vote of 1,857,610, Douglas of 1,291,574, Breckinridge of 850,082, and Bell of 646,124. In the electoral college the result was Lincoln, 180; Breckinridge, 72; Bell, 39; and Douglas, 12.

So Lincoln was elected, through the very strategy he himself had planned. And then the Civil War began. The Slave States affected to regard his election as a menace to their constitutional rights, and long before he was actually inaugurated they seceded from the Union. Indeed, before Lincoln left his home in Illinois to go to Washington and become President, six of the Southern States had organized themselves into a Confederacy and had chosen Jefferson Davis to be their President. It was on February 11, 1861, that Lincoln left Springfield, Illinois, to go to Washington and assume the office of President of the distracted country. He made the trip by a round-about way, visiting Indianapolis, Cincinnati, Columbus, Cleveland, Pittsburgh, Buffalo, Albany, New York, Trenton, Philadelphia, and Harrisburg. He thus met the Legislatures of Indiana, Ohio, New York, New Jersey, and Pennsylvania, and made addresses to them, the dominant note of which was that if the people would stand by the Constitution and the Union, no power on earth could overthrow them. Beyond doubt, these visits and speeches were of incalculable value in consolidating the sentiment of the North in support of the Union and in giving the Nation confidence in its new Chief of State. At Harrisburg he learned that a plot had been formed to assassinate him as he passed through Baltimore, then a hotbed of pro-slavery sentiment, but the only precautions he took were to travel on a train a little earlier than the one he had intended taking, and to have the telegraph wires guarded. On February 23 he reached Washington in safety, and on March 4 was inaugurated President of the United States.

We have said the secession of at least six of the Southern States occurred before he even went to Washington. That action was thus taken not because of anything he had done, or indeed was likely to do, but probably as part of a prearranged or predetermined plan to secede in any event, the moment it was evident the Slave States could no longer dominate the Federal Government. How little Lincoln, even with his strong anti-slavery convictions, proposed to meddle with State institutions and State Rights, may be seen from his first inaugural address, which is here reproduced practically in full, as the best possible exposition of the policy with which he entered upon his administration.

Thereafter the history of Lincoln was the history of the United States, which is rehearsed fully elsewhere in these volumes. It needs only to be said that he was the real head of the government, dominating with his marvelous personality every department of it, and with his unflinching tact and sound common sense harmonizing differences and smoothing down difficulties which might well have wrecked the administration of any other man. With all due credit to his associates in the Cabinet, his supporters in Congress, and his champions in the army and navy, it was he above them all who saved the Union from disruption and restored it to integrity, as it was he

who spoke the word of freedom to a race of slaves. A few of his more notable public utterances must be quoted in full, partly because of their beauty and strength as specimens of English composition, and partly because they depict, better than any words of ours could do, the character, motives and policy of the man. His first inaugural address, on March 4, 1861, was a plain, direct discussion of the great issues then before the nation, and an unequivocal declaration of his intended policy. Its salient portions were as follows:

FIRST INAUGURAL ADDRESS.

"Apprehension seems to exist among the people of the Southern States that by the accession of a Republican Administration their property and their peace and personal security are to be endangered. There has never been any reasonable cause for such apprehension. Indeed, the most ample evidence to the contrary has all the while existed and been open to their inspection. It is found in nearly all the published speeches of him who now addresses you. I do but quote from one of those speeches when I declare that 'I have no purpose, directly or indirectly, to interfere with the institution of slavery in the States where it exists. I believe I have no lawful right to do so, and I have no inclination to do so.' Those who nominated and elected me with full knowledge that I have made this and many similar declarations, and have never recanted them. And more than this, they placed in the platform for my acceptance, and as a law to themselves and to me, the clear and emphatic resolution which I now read:

"Resolved, That the maintenance inviolate of the rights of the States, and especially the right of each State 'to order and control its own domestic institutions according to its own judgment exclusively, is essential to the balance of power on which the perfection and endurance of our political fabric depend, and we denounce the lawless invasion by armed force of the soil of any State or Territory, no matter under what pretext, as among the gravest of crimes."

"I now reiterate these sentiments; and, in doing so, I only press upon the public attention the most conclusive evidence of which the case is susceptible, that the property, peace, and security of no section are to be in anywise endangered by the now incoming Administration. I add, too, that all the protection which, consistently with the Constitution and the laws, can be given, will be given to all the States when lawfully demanded, for whatever cause—as cheerfully to one section as to the other.

"There is much controversy about the delivering up of fugitives from service or labor. The clause I now read is as plainly written in the Constitution as any other of its provisions:

"No person held to service or labor in one State, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor but shall be delivered up on the claim of the party to whom such service or labor may be due."

"It is scarcely questioned that this provision was intended by those who made it for the reclaiming of what we call fugitive slaves; and the intention of the law-giver is the law. All members of Congress swear their support to the whole Constitution—to this provision as much as any other. To the proposition, then, that slaves, whose cases come within the terms of this clause, 'shall be delivered up,' their oaths are unanimous. Now, if they would make the effort in good temper, could they not, with nearly equal unanimity, frame and pass a law by means of which to keep good that unanimous oath? . . .

"I take the official oath to-day with no mental reservations, and with no purpose to construe the Constitution or laws by any hypercritical rules. And while I do not choose now to specify particular acts of Congress as proper to be enforced, I do suggest that it would be much safer for all, both in official and private stations, to conform to and abide by all those acts which stand unrepealed, than to violate any of them, trusting to find impunity in having them held to be unconstitutional.

"I hold that, in contemplation of universal law, and of the Constitution, the union of these States is perpetual. Perpetuity is implied, if not expressed, in the fundamental law of all National Governments. It is safe to assert that no Government proper ever had a provision in its organic law for its own termination. Continue to execute all the express provisions to our National Constitution, and the Union will endure forever—it being impossible to destroy it, except by some action not provided for in the instrument itself.

"Again, if the United States be not a Government proper, but an association of States in the nature of the contract merely, can it, as a contract, be peaceably unmade by less than all the parties who made it? One party to a contract may violate it—break it, so to speak; but does it not require all to lawfully rescind it?"

"Descending from these general principles, we find the proposition that, in legal contemplation, the Union is perpetual, confirmed by the history of the Union itself. The Union is much older than the Constitution itself. It was formed in fact by the Articles of Association in 1774. It was matured and continued by the Declaration of Independence in 1776. It was further matured, and the faith of all the then thirteen States expressly plighted and engaged that it should be perpetual, by the Articles of Confederation in 1778. And, finally, in 1787, one of the declared objects for ordaining and establishing the Constitution was 'to form a more perfect union.' But if destruction of the Union, by one, or by a part only, of the States, be lawfully possible, the Union is less perfect than before, the Constitution having lost the vital element of perpetuity.

"It follows, from these views, that no State, upon its own mere motion, can lawfully get out of the Union; that resolves and ordinances to that effect are legally void, and that acts of violence, within any State or States, against the Authority of the United States, are insurrectionary or revolutionary, according to circumstances. I, therefore, consider that, in view of the Constitution and the laws, the Union is unbroken, and, to the extent of my ability, I shall take care, as the Constitution itself expressly enjoins upon me, that the laws of the Union be faithfully executed in all the States. Doing this I deem to be only a simple duty on my part; and I shall perform it, so far as practicable, unless my rightful masters, the American people, shall withhold the requisite means, or, in some authoritative manner, direct the contrary. I trust this will not be regarded as a menace, but only as the declared purpose of the Union that it will constitutionally defend and maintain itself.

"In doing this, there need be no bloodshed or violence, and there shall be none, unless it be forced upon the national authority. The power confided to me will be used to hold, occupy, and possess the property and places belonging to the Government, and to collect the duties and imposts; but, beyond what may be necessary for these objects, there will be no invasion, or using of force against or among the people anywhere. Where hostility to the United States, in any interior locality, shall be so great and universal as to prevent competent resident citizens from holding the federal offices, there will be no attempt to force obnoxious strangers among the people for that object. While the strict legal right may exist in the Government to enforce the exercise of these offices, the attempt to do so would be so irritating, and so nearly impracticable with all, I deem it better to forego, for the time, the uses of such offices.

"That there are persons in one section or another who seek to destroy the Union at all events, and are glad of any pretext to do it, I will neither affirm nor deny; but if there be such I need address no word to them. To those, who really love the Union, may I not speak?"

"My countrymen, think calmly and well upon this whole subject. Nothing valuable can be lost by taking time. If there be an object to hurry any of you, in hot haste, to a step which you would never take deliberately, that object will be frustrated by taking time; but no good object can be frustrated by it. Such of you as are now dissatisfied, still have the old Constitution unimpaired, and, on the sensitive point, the laws of your own framing under it; while the new administration will have no immediate power, if it would, to change either. If it were admitted that you who are dissatisfied hold the right side in the dispute, there still is no good reason for precipitate action. Intelligence, patriotism, Christianity, and a firm reliance on Him who has never yet forsaken this favored land, are still competent to adjust, in the best way, all our present difficulties. In your hands, my dissatisfied countrymen, and not in mine, is the momentous issue of civil war. The Government will not assail you. You can have no conflict without being yourselves aggressors. You have no oath registered in Heaven to destroy the Government, while I shall have the most solemn one to 'preserve, protect, and defend it.'

"I am loth to close. We are not enemies, but friends. We must not be enemies. Though passion may have strained, it must not break our bonds of affection. The mystic chords of memory, stretching from every battlefield and patriot grave to every living heart and hearthstone, all over this broad land, will yet swell the chords of the Union, when again touched, as surely they will be, by the better angels of our nature."

This clearly expressed policy, to maintain the Union, the Constitution, and the laws, was unwaveringly followed. It brought upon Lincoln much censure from the extreme Abolitionists and others who were prone to be "expecting all things in an hour." There were even some of the wisest and soundest thinkers who for a time questioned the propriety of his course. To one of these Lincoln made the following reply, repeating with epigrammatic force the chief features of his policy:

LETTER TO HORACE GREELEY.

"EXECUTIVE MANSION,

"WASHINGTON, Friday, August 22nd, 1862.

"HON. HORACE GREELEY: *Dear Sir:*—

"I have just read yours of the 19th instant, addressed to myself through the New York Tribune.

"If there be in it any statements or assumptions of fact which I may know to be erroneous, I do not now and here controvert them.

"If there be any inferences which I may believe to be falsely drawn, I do not now and here argue against them.

"If there be perceptible in it an impatient and dictatorial tone, I waive it in deference to an old friend whose heart I have always felt to be right.

"As to the policy 'I seem to be pursuing,' as you say, I have not meant to leave anyone in doubt. I would save the Union. I would save it the shortest way under the Constitution.

"The sooner the national authority can be restored the nearer the Union will be—the Union as it was.

"If there be those who would not save the Union unless they could at the same time save slavery, I do not agree with them.

"If there be those who would not save the Union unless they could at the same time destroy slavery, I do not agree with them.

"My paramount object is to save the Union and not either to save or destroy slavery.

"If I could save the Union without freeing any slave, I would do it—and if I could save it by freeing all the slaves, I would do it—and if I could save it by freeing some and leaving others alone, I would also do that.

"What I do about slavery and the colored race, I do because I believe it helps to save the Union, and what I forbear, I forbear because I do not believe it would help to save the Union.

"I shall do less whenever I shall believe what I am doing hurts the cause, and shall do more whenever I believe doing more will help the cause.

"I shall try to correct errors when shown to be errors, and I shall adopt new views so fast as they shall appear to be true views.

"I have here stated my purpose according to my view of official duty, and I intend no modifications of my oft-expressed personal wish that all men everywhere could be free.

Yours, "A. LINCOLN."

The Emancipation Proclamation, abolishing slavery in the seceded States was issued, as a "war measure," on January 1, 1863, its purpose being to aid the work of suppressing the rebellion and of restoring the Union. Later in the same year, on November 19, 1863, he made his brief but most memorable address at the consecration of the National Cemetery on the battlefield of Gettysburg, of which the keynote was devotion to the maintenance of the Union. That address was as follows:

GETTYSBURG ORATION.

"Fourscore and seven years ago our fathers brought forth upon this Continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

"Now, we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We are met to dedicate a portion of it as the final resting place of those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

"But in a larger sense we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here, have consecrated it far above our power to add or detract. The world will little note nor long remember what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated here to the unfinished work that they have thus far so nobly carried on. It is rather for us to be here dedicated to the great task remaining before

us,—that from these honored dead we take increased devotion to the cause for which they here gave the last full measure of devotion,—that we here highly resolve that the dead shall not have died in vain, that the nation shall, under God, have a new birth of freedom, and that the government of the people, by the people, and for the people, shall not perish from the earth."

In the fall of 1864 Lincoln was re-elected President, by a good majority of the popular vote and by an overwhelming majority of the electoral college. On March 4, 1865, he was inaugurated for his second term, and on that occasion delivered what we must consider as not only the greatest address of his own career but perhaps the greatest ever uttered by mortal man. The strain of spiritual exaltation which pervades and dominates it is comparable with nothing less than that of one of the greatest of the old Hebrew prophets, and it seems instinct with an unexpressed premonition of his impending doom and even to anticipate the ineffable vision that awaited him beyond the veil of the unfathomed and unknown. Its full text follows:

SECOND INAUGURAL ADDRESS.

"Fellow-Countrymen: At this second appearing to take the oath of the Presidential office, there is less occasion for an extended address than there was at the first. Then, a statement, somewhat in detail, of a course to be pursued, seemed fitting and proper. Now, at the expiration of four years, during which public declarations have been constantly called forth on every point and phase of the great contest which still absorbs the attention and engrosses the energies of the nation, little that is new could be presented. The progress of our arms, upon which all else chiefly depends, is as well known to the public as to myself; and it is, I trust, reasonably satisfactory and encouraging to all. With high hope for the future, no prediction in regard to it is ventured.

"On the occasion corresponding to this four years ago, all thoughts were anxiously directed to an impending civil war. All dreaded it—all sought to avert it. While the inaugural address was being delivered from this place, devoted altogether to saving the Union without war, insurgent agents were in the city seeking to destroy it without war—seeking to dissolve the Union, and divide effects, by negotiation. Both parties deprecated war; but one of them would make war rather than let the nation survive; and the other would accept war rather than let it perish. And the war came.

"One-eighth of the whole population were colored slaves, not distributed generally over the Union, but localized in the southern part of it. These slaves constituted a peculiar and powerful interest. All knew that this interest was, somehow, the cause of the war. To strengthen, perpetuate and extend this interest was the object for which the insurgents would rend the Union, even by war; while the government claimed no right to do more than to restrict the territorial enlargement of it. Neither party expected for the war the magnitude or the duration which it has already attained. Neither anticipated that the cause of the conflict might cease with, or even before, the conflict itself ceases. Each looked for an easier triumph, and a result less fundamental and astounding. Both read the same Bible, and pray to the same God; and each invokes his aid against the other. It may seem strange that any man should dare to ask a just God's assistance in wringing their bread from the sweat of other men's faces; but let us judge not, that we be not judged. The prayers of both could not be answered—that of neither has been answered fully. The Almighty has His own purposes.

"Voe unto the world because of offences, for it must needs be that offences come; but woe to that man by whom the offence cometh." If we shall suppose that American slavery is one of those offences which, in the Providence of God, must needs come, but which, having continued through His appointed time, He now wills to remove, and that He gives to both North and South this terrible war, as a woe due to those by whom the offence came, shall we discern therein any departure from those divine attributes which the believers in a living God always ascribe to Him? Fondly do we hope—ferently do we pray—that this mighty scourge of war may speedily pass away. Yet, if God wills that it continue until all the wealth piled by the bondmen's two hundred and fifty years of unrequited toil shall be sunk, and until every drop of blood drawn with the lash shall be paid by another drawn with the sword, as was said three thousand years ago, so still it must be said, 'The judgments of the Lord are true and righteous altogether.'

"With malice toward none; with charity for all; with firmness in the right, as God gives us to see the right, let us strive on to finish the work we are in; to bind up the nation's wounds, to care for him who shall have borne the battle, and for his widow and his orphan—to do all which may achieve and cherish a just and a lasting peace among ourselves, and with all nations."

After this, the end soon came. The Confederacy fell. Richmond surrendered, and Lincoln visited it and walked through its once defiant precincts, more as redeemer than conqueror. A few days later Lee surrendered. It was planned to raise the National banner again over the ruins of Fort Sumter on April 14, the fourth anniversary of the day which had witnessed the pulling down of that flag and the raising of the Confederate flag in its place. That date also marked the end of the savior of the Union. His work was done. Cares were beginning to relax. Peace had come at last. And then, suddenly, through one more brief storm, came eternal peace. On the evening of April 14, 1865, an assassin entered the box in which he sat at a theatre, and shot him through the brain. Before morning he was dead. The tragedy was a part of a plot to destroy a number of the chief officers of the government. It was organized and carried out by a party of Southern sympathizers, more in sheer revenge for the defeat of secession than in any hope of thus revivifying the "Lost Cause." Of all who were aimed at, however, Lincoln alone was killed. His assassin, John Wilkes Booth, was soon after slain while resisting arrest; four of his accomplices, Payne, Atzerot, Harold, and Mrs. Surratt, were hanged; three, Arnold, Mudd and McLaughlin, were imprisoned for life; and one, Spangler, was imprisoned for six years. The nation was plunged into such mourning as it never before had known; in which it commanded the sympathy of the whole civilized world. The body of the martyr was borne from Washington to Springfield by almost exactly the same route he had followed in going to Washington four years before, and imposing ceremonies were held at every important point along the way. Not until May 4 did the funeral train reach the cemetery at Springfield, where the dust of the Great Emancipator was consigned to the dust from whence it sprung, while the Spirit had returned to God who gave it.

W. FLETCHER JOHNSON.

LINCOLN, BENJAMIN, an American general, was born at Hingham, Mass., January 24, 1733; in 1776 reinforced Washington after the defeat on Long Island, and served with him that year; in 1777 was appointed major-general, was wounded in October, received command of the southern department, and in 1780 was besieged by Clinton in Charleston, and compelled to capitulate. He was exchanged a year later, took part in the siege of Yorktown, and was deputed to receive Cornwallis' sword. He was secretary of war from 1781 to 1784, and died May 9, 1810.

LINDAU, a town in the government district of Swabia and Neuburg, Bavaria, and the central part of the transit trade between that country and Switzerland, is situated on two islands off the northeastern shore of Lake Constance. Population (1900), about 7,000.

LINDLEY, JOHN, botanist, was born at Catton, near Norwich, England, in 1799, and died in 1865.

LINDSAY, the chief town of Victoria county, Ontario, is situated on the river Scugog, at the junction of several railroads. It contains three banks, a number of good stores and factories, and has an extensive trade in grain and lumber. Population (1901), 7,003.

LINDSEY, THEOPHILUS, an English theological writer, was born in Middlewich, Cheshire, England, in 1723, and died in 1808.

LINEN MANUFACTURES. Under this term are comprehended all yarns spun and fabrics woven from flax fiber. The cultivation and preparation of the fiber, and its treatment till it reaches the market as a commercial product, are dealt with under FLAX.

From the earliest periods of human history till almost

the close of the eighteenth century the linen manufacture was one of the most extensive and widely disseminated of the domestic industries of European countries. The preparation and spinning of yarn gave occupation to women of all classes; and the operations of weaving employed large numbers of both sexes. The industry was most largely developed in Russia, Austria, Germany, Holland, Belgium, the northern provinces of France, and certain parts of England, in the north of Ireland, and throughout Scotland; and in these countries its importance was generally recognized by the enactment of special laws, having for their object the protection and extension of the trade. The inventions of Arkwright, Hargreaves, and Crompton in the later part of the eighteenth century, benefiting, as they did, almost exclusively, the art of cotton spinning, and the unparalleled development of that branch of textile manufactures, largely due to the ingenuity of these inventors, gave the linen trade as it then existed a fatal blow. Domestic spinning, and with it hand-loom weaving, immediately began to shrink; a large and most respectable section of the operative classes in western Europe found their employment dwindling away, and the wages they earned from their diminished labor insufficient to ward off starvation. The trade which had supported whole villages and provinces entirely disappeared, and the linen manufacture, in attenuated dimensions and changed conditions, took refuge in special localities, where it resisted, not unsuccessfully, the further assaults of cotton, and, with varying fortunes, rearranged its relations in the community of textile industries. The linen industries of Great Britain were the first to suffer from the aggression of cotton; more slowly the influence of the rival textile traveled across Continental countries; and even to the present day, in Russia, and in other regions remote from great commercial highways, the domestic manufacture of linens holds its place almost as it has done from the earliest period. In 1810 Napoleon I., with a view partly to promote Continental linen industries, and partly to strike a blow at the great British manufacture of cotton, issued a proclamation offering a reward of one million francs to any inventor who should devise the best machinery for the spinning of flax yarn. Within a few weeks thereafter Philippe de Girard patented in France important inventions for flax spinning by both dry and wet methods. His inventions, however, did not receive the promised reward, and were indeed neglected in his native country. In 1815 he was invited by the Austrian Government to establish a spinning-mill at Hirtenberg, near Vienna, which was run with his machinery for a number of years, but ultimately it failed to prove a commercial success. In the meantime, however, English inventors had applied themselves to the task of adapting machines to the preparation and spinning of flax. The foundation of machine spinning of flax was laid by John Kendrew and Thomas Porthouse of Darlington, who, in 1787, secured a patent for "a mill or machine upon new principles for spinning yarn from hemp, tow, flax, or wool." These machines, imperfect as they were, attracted much notice, and were introduced in various localities both in England and Scotland into mills fitted specially for flax spinning. By innumerable successive improvements and modifications, the invention of Kendrew and Porthouse developed into the perfect system of machinery with which, at the present day, spinning-mills are furnished; but progress in adapting flax fibers for mechanical spinning, and linen yarn for weaving cloth by power loom, was much slower than in the corresponding case of cotton.

The implements used in the preparation of linen yarn in ancient and modern times, down to the end of the

eighteenth century, were of the most primitive and inexpensive description. Till comparatively recent times, the sole spinning implements were the spindle and distaff. The spindle, which is the fundamental apparatus in all spinning machinery, was nothing more nor less than a round stick or rod of wood about twelve inches in length, tapering toward each extremity, and having at its upper end a notch or slit into which the yarn might be caught or fixed. In general, a ring or "whorl" of stone or clay was passed round the upper part of the spindle to give it momentum and steadiness when in rotation. The distaff, or rock, was a rather longer and stronger bar or stick, around one end of which, in a loose coil or ball, the fibrous material to be spun was wound. The other extremity of the distaff was carried under the left arm, or fixed in the girdle at the left side, so as to have the coil of flax in a convenient position for drawing out to yarn. A prepared end of yarn being fixed into the notch, the spinster, by a smart rolling motion of the spindle with the right hand against the right leg, threw it out from her, spinning in the air, while, with the left hand, she drew from the rock an additional supply of fiber which was formed into a uniform and equal strand with the right. The yarn being sufficiently twisted was released from the notch, wound around the lower part of the spindle, and again fixed in the notch at the point insufficiently twisted; and so the rotating, twisting, and drawing-out operations went on till the spindle was full. So persistent is an ancient and primitive art of this description that to the present day, in remote districts of Scotland—the country where machine spinning has attained its highest development—spinning with rock and spindle is yet practiced; and, rude as these implements are, yarn of extraordinary delicacy, beauty, and tenacity has been spun by their agency. The first improvement on the primitive spindle was found in the construction of the hand-wheel, in which the spindle, mounted in a frame, was fixed horizontally, and rotated by a band passing round it and a large wheel, set in the same framework. Such a wheel became known in Europe about the middle of the sixteenth century, but it appears to have been in use for cotton spinning in the East from time immemorial. At a later date, which cannot be fixed, the treadle motion was attached to the spinning wheel, enabling the spinster to sit at work with both hands free; and the introduction of the two-handed or double-spindle wheel, with flyers or twisting arms on the spindles, completed the series of mechanical improvements effected on flax spinning till the end of the eighteenth century. The common use of the two-handed wheel throughout the rural districts of Ireland and Scotland is a matter still within the recollection of middle-aged people; but spinning wheels are now seldom seen.

The modern manufacture of linen divides itself into two branches, spinning and weaving, to which may be added the bleaching and various finishing processes, which, in the case of many linen textures, are laborious undertakings and important branches of industry. Flax, when received into the mills, has to undergo a train of preparatory operations before it arrives at the stage of being twisted into yarn. The whole operations in yarn manufacture comprise heckling, preparing, and spinning.

Linen fabrics are numerous in variety and widely different in their qualities, appearance and applications, ranging from heavy sailcloth and rough sacking to the most delicate cambrics and lawns. Linen fabrics have several advantages over cotton, resulting principally from the microscopic structure and length of the flax fiber. The cloth is much smoother and more lustrous than cotton cloth; and, presenting a less "wooly" surface, it does not soil so readily, nor absorb and retain moist-

are so freely, as the more spongy cotton; and it is at once a cool, clean, and healthful material for bed-sheeting and clothing. Bleached linen, starched and dressed, possesses that unequaled purity, gloss, and smoothness which make it alone the material suitable for shirt-fronts, collars and wristbands; and the gossamer delicacy, yet strength, of the thread it may be spun into fits it for the fine lace-making to which it is devoted. Flax is a heavier material than cotton, but weight for weight it is much stronger, single yarn having proportionate strength in the ratio of 3 to 1.83, doubled yarn 3 to 2.26, and cloth 3 to 2.13. Of course cotton, on the other hand, has many advantages peculiarly its own. The application of machine power to the entire range of linen manufactures has greatly improved the position and developed the resources of the industry, so that linen now occupies a well-defined and important position among the principal textiles.

LING (*Molva vulgaris*), a fish of the cod-fish family (*Gadidae*), readily recognized by its long body, two dorsal fins (of which the anterior is much shorter than the posterior), single long anal fin, separate caudal fin, a barbel on the chin, and large teeth in the lower jaw and on the palate. Its usual length is from three to four feet, but larger individuals of five or six feet in length, and some seventy pounds in weight, have been taken. The ling is found in the North Atlantic, from Spitzbergen and Iceland southward to the coast of Portugal. Its proper home is the German Ocean; especially on the coasts of Norway, Denmark, Great Britain, and Ireland it occurs in great abundance, generally at some distance from the land, in depths varying between fifty and one hundred fathoms. During the winter months it approaches the shores, when great numbers are caught by means of long lines. On the American side of the ocean it is less common, although generally distributed along the south coast of Greenland, and on the banks of Newfoundland. This fish is one of the most valuable species of the cod-fish family; a certain number are consumed fresh, but by far the greater portion are prepared for exportation to various countries on the Continent (Germany, Spain, Italy).

LING. See HEATH.

LINGARD, JOHN, the Roman Catholic historian of England, was born of humble parentage at Winchester on February 5, 1771. His intellectual abilities began to manifest themselves at a very early age, and in 1782 he was sent to the English college at Douay, where he continued until shortly after the declaration of war by England (1793). For some time after his return to England he lived as tutor in the family of Lord Stourton, but in October, 1794, he settled along with seven other former members of the old Douay college at Crook Hall near Durham, where on the completion of his theological course he became vice-president of the reorganized seminary. In 1795 he was ordained priest, and soon afterward undertook the charge of the chairs of natural and moral philosophy. In 1808 he accompanied the community of Crook Hall to the new and more commodious buildings at Ushaw, Durham, but in 1811, after declining the presidency of the college at Maynooth, he withdrew to the secluded mission at Hornby in Lancashire, where for the rest of his life he found the leisure which his literary pursuits demanded. In 1817 he visited Rome, where he made some researches in the Vatican Library, and also negotiated some business connected with the English college. In 1821 Pope Pius VII. created him doctor of divinity and of canon and civil law; and in 1825 Leo XII. is said to have made him cardinal *in petto*. He died at Hornby on July 17, 1851.

LINKÖPING, a city of Sweden, the see of a bishop,

and the chief town of the province of East Gothland, is situated in a fertile plain twenty-one miles southwest of Stockholm. Most of the houses are of wood. The cathedral (1150-1499), a Romanesque building with a Gothic choir, is next to the cathedral of Upsala, the largest church in Sweden, and, since the cathedral of Trondhjem has lost so many of its treasures, presents the richest variety of objects of interest to the student of mediæval art in the country. Population (1901), 14,552.

LINLITHGOW, or WEST LOTHIAN, a country of Scotland, stretching for seventeen miles along the south coast of the Firth of Forth, and bounded east and south-east by Edinburghshire or Midlothian, southwest by Lanarkshire, and West by Stirlingshire. According to the ordnance survey the area is 120 square miles, or 81,114 acres, a considerable increase on previous estimates. The whole country lies in the basin of the Forth, and there is a general slope upward from the shore of the firth to the hilly district in the southwest. The surface is diversified by hill and dale, and, with the exception of the upland moors on the borders of Lanarkshire, there is no extensive tract of level ground. Coal-mining has been prosecuted in the county probably from the time of the Romans. In 1871 it was estimated by the government commissioners that the Linlithgow coal-fields still contained 127,621,800 tons of coal accessible at depths not exceeding 4,000 feet. About 1,440 miners were employed in the twenty coal-mines in 1881, and the output for the year was 504,338 tons. At the same date there were six iron-mines in operation, with 926 miners and an output of 180,194 tons. Pop. (1901), 65,699.

LINLITHGOW, the county town of the above county, and a royal and parliamentary burgh, is situated in the central valley, eighteen miles by rail from Edinburgh. Population, 4,000.

LINNÆUS. Carl von Linné, better known under his earlier name of Carolus Linnæus, was born May 13, 1707, O.S., at Rashult, in the parish of Stenbroholt, in the province of Smaland, Sweden. His parents were Nils Linnæus, the comminister, afterward pastor, of the parish, and Christina, the daughter of Brodersonius, the previous incumbent; Carl, the subject of our notice, being their eldest child.

His formal education began in 1714, when he was put under the private tuition of Telander, and three years later he entered the primary school at Wexiö. In 1719 he was committed to the care of Gabriel Hök, who afterwards married his pupil's sister Anna Maria; this preceptor had greater skill as a teacher than his predecessors, and was less severe; still he was unable to overcome the distaste the youth had acquired for ordinary scholastic studies. During his last years at school Linnæus took advantage of the greater liberty then allowed him to ramble in search of plants.

In 1724 he passed from the school to the gymnasium, carrying with him the same dislike for all those studies which were considered necessary for admission to holy orders, his father's intention being to bring up his son in his own profession. Botany, a science at that time entirely neglected, almost wholly engrossed his attention.

He proceeded to the university of Lund in 1727, bearing a dubiously worded testimonium from Nile Krok, the rector of the gymnasium, to the effect that shrubs in a garden may disappoint the cares of the gardener, but if transplanted into different soil may prosper, therefore the bearer was sent to the university, where, perchance, he might find a more propitious climate. His former preceptor Hök kept back this doubtful recommendation, and presented Linnæus to the rector and dean as his own private pupil, thus procuring his matriculation.

While studying here, Linnæus lodged at the house of Dr. Kilian Stobæus, afterward professor of medicine, and physician to the king, who possessed an excellent museum of minerals, shells, birds, and dried plants; the methods of preservation here adopted were as a revelation to the young student, and taught him how to prepare his own acquisitions.

In the autumn of 1729, Linnæus was engaged intensely examining some plants growing in the academical garden, when a clergyman asked him what he was studying, whether he understood botany, whence he came, and how long he had been busied in the study. After being questioned at length, he was requested to follow his companion home; there he discovered him to be Dr. Olaf Celsius, professor of theology, at that time working at his *Hierobotanicon*, which saw the light nearly twenty years later. When the professor saw Linnæus' collections he was still more impressed, and, finding him necessitous, he offered him board and lodging; he afterward admitted him to close intimacy, and allowed him the free use of his rich library. The temporary adjuncts of the faculty of medicine being incompetent, Linnæus, by the recommendation of Celsius, was able to get some private pupils, and thereby to assume a more creditable appearance.

At this time there was only one medical student who distinguished himself by diligence in study, and that was Peter Arctedius, who afterward styled himself Artedi. A close friendship sprang up between the two young men; they studied in concert, and vied with each other in their attainments, with perfect good temper though of very diverse dispositions. Linnæus was sovereign in ornithology, entomology, and botany, Artedi reserving to himself the umbelliferous plants, fishes, and amphibia. A silence, almost total, prevailed in the university at this time on topics of natural history; during his whole curriculum Linnæus did not hear a single public lecture delivered on anatomy, botany, or chemistry.

During this period of intense receptivity, he came upon a critique which ultimately led to the establishment of his artificial system of plant classification. This was a review of Vaillant's *Sermo de Structura Florum*, Leyden, 1718, a thin quarto in French and Latin; it set him upon examining the stamens and pistils of flowers, and, becoming convinced of the paramount importance of these organs, he formed the idea of basing a system of arrangement upon them. Another work by Wallin having fallen into his hands, he drew up a short treatise on the sexes of plants, and showed it to Doctor Celsius, who put it into the hands of the younger Olaf Rudbeck, at that time professor of botany in the university. In the following year Rudbeck, whose advanced age compelled him to lecture by deputy, appointed Linnæus his adjunctus; in the spring of 1730, therefore, the latter began his lectures, and was accompanied by many pupils on his botanical excursions. The academic garden was entirely remodeled under his auspices, and furnished with many rare species, he being now in a position to direct the gardener, whereas in the year before he had actually solicited appointment to the vacant post of gardener, which was refused him on the ground of his capacity for better things.

His evenings were devoted to the preparation of his epoch-making books, which were issued several years afterward in the Netherlands. His position at the university having become unpleasant, he readily undertook to explore the little known country of Lapland, at the cost of the Academy of Sciences of Upsala. In 1733 Linnæus was engaged in teaching the method of assaying ores, and hoped to be allowed to lecture on botany;

but a quarrel broke out between a rival, Rosen, and himself, the former having, by private influence, contrived to get a prohibition put on all private lectures on medicine in the university. Linnæus, enraged at finding his livelihood thus cut off, went so far as to draw his sword upon Rosen, but was prevented from harming his antagonist. At this juncture the governor of Dalecarlia invited Linnæus to travel through his province, as he had done through Lapland. While on this journey he lectured at Fahlun to large audiences; Browallius, the chaplain there, afterward bishop of Abo, strongly urged Linnæus to go abroad and take his degree of M.D. at a foreign university, by which means he could afterward settle where he pleased. Linnæus, having become attached to the eldest daughter of Doctor Moré or Moræus, left Sweden in 1735 to seek his fortune in the manner stated, and to return to claim her hand.

He traveled by Lübeck and Hamburg; detecting a seven-headed hydra to be a fabrication at the latter, he was obliged to quit the town in haste to avoid the wrath of its possessor. From Altona he went by sea to Amsterdam, staying there a week; he then proceeded to Harderwijk, where he went through the requisite examination, and defended his thesis on the cause of intermittent fever. His scanty funds were now nearly spent, but he passed on through Haarlem to Leyden; there he called on Gronovius, who, returning the visit, was shown the *Systema Naturæ* in MS., and was so greatly astonished at it that he sent it to press at his own expense. The first edition was in eight folio sheets; the subsequent editions were in 8vo.; and the twelfth immensely enlarged edition appeared during the author's lifetime. This famous system, which, artificial as it was, substituted order for confusion, largely made its way on account of the lucid and admirable laws, and comments on them, which were issued almost at the same time. (See BOTANY.) Boerhaave, whom Linnæus saw after waiting eight days for admission, recommended him to Burman at Amsterdam, where he stayed a twelvemonth, living at the house of the professor. While there he issued his *Fundamenta Botanica*, an unassuming small octavo, which has exercised immense influence. The wealthy banker Clifford having invited Linnæus to visit his magnificent garden at Hartecamp, he remained there, living like a prince, but working most assiduously in the garden and library, both of which were kept up without regard to cost. His *Flora Lapponica* was now printed, containing a description of the genus *Linnæa*, by his friend Gronovius; he selected this plant to bear his name, from a similarity, as he thought, between it and himself.

In 1736 Linnæus visited England. He was warmly recommended by Boerhaave to Sir Hans Sloane, but the old collector seems to have received him coldly. A better reception awaited him at Oxford, where Doctor Shaw welcomed him cordially; Dillenius, the professor of botany there, was icy at first, but afterward thawed completely, kept him a month, and even offered to share the emoluments of the chair with him.

On his return to the Netherlands he completed the printing of his *Genera Plantarum*, a volume which must be considered the starting point of modern systematic botany; Tournefort formed many genera, but Linnæus was the first to circumscribe them. During the same year, 1737, Linnæus finished arranging Clifford's collection of plants, living and dried; these were described in the *Hortus Cliffortianus*, a folio illustrated with engravings by Ehret; this book was entirely written in nine months. During the compilation he used to "amuse" himself with drawing up the *Critica Botanica*, also printed in the Netherlands. But this

strenuous and unremitting labor told upon him; the atmosphere of the Low Countries seemed to oppress him beyond endurance; he resisted all Clifflort's entreaties to remain with him, and started homeward.

Van Royen managed to detain him a year at Leyden, to help in rearranging the garden, thereby offending Clifflort, whom he had quitted on the plea of hastening back to Sweden. Linnæus now published his *Classes Plantarum*, and almost at the same time appeared Van Royen's *Hortus Leydensis* and Gronovius' *Flora Virginica*, both of these being drawn up on the Linnæan system. In 1738 Boerhaave pressed Linnæus to accept a post at Surinam; he declined this for himself, but passed it on to Johan Bartsch of Königsberg, a member with himself of a select club of naturalists at Leyden. Bartsch ultimately fell a victim to the climate of that colony.

While residing at Leyden Linnæus was warned that one of his acquaintances was endeavoring to supplant him in the affections of Sara Moré; he intended to set out at once, but was attacked by ague before he could start. Clifflort, hearing of this, took Linnæus to his own house again, and would not suffer him to depart until he was sufficiently well. His complete recovery, however, did not take place until he had gained the higher country of Brabant, where, in one day, he felt himself entirely renovated. He continued his journey to Paris, where he visited Antoine and Bernard de Jussieu, botanizing with the latter. Abandoning all notion of returning through Germany, he went to Rouen, sailed for Sweden, and landed at Helsingborg.

Linnæus established himself in September, 1738, as physician in Stockholm, but, being unknown as a medical man, no one at first dared to consult him, a great change from the attention paid to him abroad; he himself declared "that, had he not been in love, he would certainly have left his native country." By degrees he found patients, was then appointed naval physician at Stockholm, with minor appointments, and was married on June 26, 1739.

Early in 1740 Rudbeck died, and Roberg resigned; the chairs of botany and medicine at Upsala being thus vacant, Rosen and Linnæus were chosen respectively to fill them. The former rivals afterward agreed to exchange professorships to their mutual benefit; in 1741, previous to this exchange, Linnæus traveled through Öland and Gothland, by command of the state, publishing his results in *Öländska och Gothländska Resa*, 1745. The index to this volume shows the first employment of trivial names in nomenclature.

Henceforward his life was a continuous course of prosperity, his time being taken up by teaching and the preparation of other works. In the year 1745 he issued his *Flora Suecica* and *Fauna Suecica*, the latter having occupied his attention during fifteen years; afterward, two volumes of observations made during journeys in Sweden, *Wästgöta Resa*, Stockholm, 1747, and *Skånska Resa*, Stockholm, 1751. He examined the collections made many years before in Ceylon by Hermann, the full publication taking place in his *Flora Zeylanica*, Stockholm, 1747. In 1748 he brought out his *Hortus Upsaliensis*, showing that he had added 1,100 species to those formerly in cultivation in that garden. In 1750 his *Philosophia Botanica* was given to the world; it consists of a commentary on the various axioms he had published in 1735 in his *Fundamenta Botanica*, and was dictated to his pupil Löfling.

He catalogued the Queen's Museum at Drottningholm, and the King's at Ulrichsdal, but the most important work of this period of his life is unquestionably his *Species Plantarum*, Stockholm, 1753—second edition being issued in 1762. In this volume the trivial names are

fully set forth; although they had been previously shadowed forth by Linnæus and others, yet to him belongs the merit of establishing the use of a single epithet in addition to the generic name. In the same year Linnæus was created knight of the Polar Star, the first time a scientific man had been raised to that honor in Sweden.

In 1755 he was invited by the king of Spain to settle in that country, with a liberal salary, and full liberty of conscience, but he declined on the ground that whatever merits he possessed should be devoted to his country's service; Löfling was sent instead, but died within two years. He was enabled now to purchase the estates of Söfja and Hammarby; at the latter he built his museum of stone to guard against loss by fire. His lectures at the university drew men from all parts of the world; the normal number of students at Upsala was 500; while he occupied the chair of botany there it rose to 1,500. In 1761 a patent of nobility was granted, antedated to 1757, from which time Linnæus was styled Carl von Linné; his arms were those now borne by the Linnean Society of London. To his great delight the tea plant was introduced alive into Europe in 1763; this year also his son Carl was allowed to assist his father in his professional duties, and to be trained as his successor. At the age of sixty Linné's memory began to fail; an apoplectic attack in 1774 greatly weakened him; two years afterward he lost the use of his right side; and he died January 10, 1778, of an ulceration of the bladder. He was buried in the cathedral of Upsala, with every token of regret.

LINNET, JOHN, a gifted English painter, was born in London on June 16, 1792. His father being a carver and gilder, Linnet was early brought into contact with artists, and when he was ten years old he was already drawing and selling his portraits in chalk and pencil. His first artistic instruction was received from Benjamin West, and he spent a year in the house of John Varley the water-color painter, where he had William Hunt and Mulready as fellow pupils, and made the acquaintance of Shelley, Godwin, and other men of mark and individuality. In 1805 he was admitted a student of the Royal Academy, where he obtained medals for drawing, modeling, and sculpture. He was also trained as an engraver, and executed a transcript of the *Burial of Saul*, one of Varley's most impressive pictures. In after life he frequently occupied himself with the burin, publishing, in 1834, a series of outlines from Michelangelo's frescoes in the Sistine chapel, and, in 1840, superintending the issue of a selection of plates from the pictures in Buckingham Palace, one of them, a Titian landscape, being mezzotinted by himself. At first he supported himself mainly by miniature painting, and by the execution of larger portraits, such as the likenesses of Mulready, Whately, Peel, and Carlyle. He also painted many subjects like the *St. John Preaching*, the *Covenant of Abraham*, and the *Journey to Emmaus*, in which, while the landscape background is unusually prominently insisted upon, the figures are yet of sufficient size and importance to supply the title of the work. But it is mainly in connection with his long series of paintings of pure landscape that his name is known to the public. His works commonly deal with some scene of typical uneventful English landscape, which is made impressive by a gorgeous effect of sunrise or sunset. His art proved exceptionally remunerative; he was able to command very large prices for his pictures, and about 1850 he purchased a property at Redhill, Surrey, where he resided till his death, on January 20, 1882.

LINNET, originally a somewhat generalized bird's name, but latterly specialized for the *Fringilla canna-*

bina of Linnæus, the *Linota cannabina* of recent ornithologists. This is a common and well-known song-bird, frequenting almost the whole of Europe and in Asia extending to Turkestan. In Africa it is known as a winter visitant to Egypt and Abyssinia, and is abundant at all seasons in Barbary, as well as in the Canaries and Madeira. Though the fondness of this species for the seeds of flax and hemp has given it its common name in so many European languages, it feeds largely, if not chiefly, in Britain on the seeds of plants of the order *Compositæ*, especially those growing on heaths and commons. According to its sex, or the season of the year, it is known as the Red, Gray, or Brown Linnet, and by the earlier English writers on birds, as well as in many localities at the present time, these names have been held to distinguish at least two species; but there is now no question among ornithologists on this point, though the conditions under which the bright crimson-red coloring of the breast and crown of the cock's spring and summer plumage is donned and doffed may still be open to discussion. The Linnet begins to breed in April, the nest being generally placed in a bush at no great distance from the ground. It is nearly always a neat structure composed of fine twigs, roots, or bents, and lined with wool or hair. The eggs, often six in number, are of a very pale blue marked with reddish or purplish brown. Two broods seem to be commonly brought off in the course of the season, and toward the end of the summer the birds—the young, of course, greatly preponderating in number—collect in large flocks and move to the sea-coast, whence a large proportion depart for more southern latitudes. Of these emigrants some return the following spring, and are invariably recognizable by the more advanced state of their plumage, the effect presumably of having wintered in countries enjoying a brighter and hotter sun.

LINOLEUM is a kind of floor-cloth, invented and introduced by Mr. F. Walton, who in 1860 obtained a patent for its manufacture. It consists of a preparation of linseed oil and ground cork intimately mixed and spread in a uniform layer over a sheet of rough jute canvas. Under the name of kamptulicon, a material similar in appearance and properties, but in which prepared india-rubber took the place of oxidized linseed oil, was in use to a limited extent previous to the introduction of linoleum; the latter material, however, was found to possess several advantages; among others it had the merit of comparative cheapness as against kamptulicon, which it entirely supplanted. Linoleum also became a formidable competitor with the old form of oil floor-cloth.

LINSEED is the seed of the common flax or lint, *Linum usitatissimum*, from which also the well-known fiber flax is obtained. The fruit of the flax plant consists of a globose capsule which splits into five cocci, each containing two seeds. These seeds, the linseed of commerce, are of a lustrous brown color externally, and a compressed and elongated oval form, with a slight beak or projection at one extremity. The brown testa contains, in the outer of the four coats into which it is microscopically distinguishable, an abundant secretion of mucilaginous matter; and it has within it a thin layer of albumen, inclosing a pair of large oily cotyledons. The seeds when placed in water for some time become coated with glutinous matter from the exudation of the mucilage in the external layer of the epidermis; and by boiling in sixteen parts of water they exude sufficient mucilage to form with the water a thick, pasty decoction. The cotyledons contain the valuable linseed oil referred to below. Linseed grown in tropical countries is much larger and more plump than that obtained in temperate climes, but the seed from the

colder countries, on the other hand, yields a finer quality of oil. Linseed is cultivated and secured as a crop in all flax-growing countries, where the seed is probably not less valuable than the fiber.

Apart from its value as a source of oil, and for sowing, linseed is not a product of much economic importance. It formed an article of food among the Greeks and Romans, and it is said that the Abyssinians at the present day eat it roasted. The oil is to some extent used as food in Russia, and in parts of Poland and Hungary. Linseed meal, partly on account of its bland, oily constitution, is a valuable material for poultices. At one time the crushed seeds were the officially recognized cataplastic material, but the readiness with which that preparation became rancid through the oxidation of its abundant oil frequently rendered it a dangerous application for open sores.

Linseed Oil, the most valuable and characteristic of the series of drying oils, is obtained by expression from the seeds, with or without the aid of heat. Preliminary to the operation of pressing, the seeds are crushed between a pair of revolving rollers, and ground to a fine meal under heavy edge stones on a stone bed. For the extraction of the fine quality of oil known as cold-drawn the meal is, without further preparation, filled into woollen or canvas bags and inclosed in horse-hair envelopes for pressure, either in a Dutch mill worked by means of wedges and falling stampers or in a screw press, or, what is now more prevalent, in a special form of hydraulic press. The oil so obtained is of a clear yellow color, and is comparatively devoid of odor and taste. The cake left by cold pressure is again ground up, heated in a steam kettle to about 212° Fahr., and while hot submitted to further pressure, which results in the exudation of a less pure oil of a brownish-yellow color. In general practice, cold-drawn oil is little prepared; the linseed after grinding is submitted to a high heat, whereby the mucilage in the epidermis is destroyed, and the oil flows more freely; and in many crushing establishments the oil is obtained by a single operation under the press. The yield of oil from different classes of seed varies, but from 23 to 28 per cent. of the weight of the seed operated on should be obtained. A good average quality of seed weighing about 392 pounds per quarter has been found in practice to give out 109 pounds of oil.

LINUS is one of a numerous class of heroic figures in Greek legend, of which other examples may be found under HYACINTHUS ADONIS. The connected legend is always of the same character: a beautiful youth, fond of hunting and rural life, the favorite of some god or goddess, suddenly perishes by a terrible death in spite of the heavenly love that would fain protect him. In some cases nothing is known to us with certainty beyond the mythological figure, but in many cases the religious background from which the legend stands out in relief has been preserved to us; in such cases we see that an annual ceremonial, everywhere of the same enthusiastic character, commemorated the legend.

LINUS, one of the saints of the Gregorian canon, was, according to the *Breviarium Romanum*, the immediate successor of Peter in the see of Rome. He was a native of Volterra, who had attained a high degree of sanctity, and by his prevailing faith was able, not only to cast out devils, but to raise the dead. He was beheaded by the orders of the ungrateful consul Saturninus, whose daughter he had freed from demoniac possession, after a pontificate of eleven years two months and twenty-three days.

LINZ, capital of Upper Austria, and see of a bishop, lies upon the right bank of the Danube, ninety-eight miles west of Vienna, at the junction of the Kaiferin-

Elizabeth Western Railway with a line from Prague and Budweis. Population (1890), 40,000.

LION. From the earliest historic times few animals have been better known to man than the lion. Its geographical habitat made it familiar to all the races among whom human civilization took its origin, and its strongly marked physical and moral characteristics have rendered it proverbial, perhaps to an exaggerated degree, and have in all ages afforded favorite types for poetry, art, and heraldry. The literature of the ancient Hebrews abounds in allusions to the lion; and the almost incredible numbers that are stated to have been provided for exhibition and destruction in the Roman amphitheaters (as many as 600 on a single occasion by Pompey, for example) show how abundant these animals must have been within accessible distance of the capital of the world.

The geographical range of the lion was once far more extensive than at present, even within the historic period covering the whole of Africa, the south of Asia, including Syria, Arabia, Asia Minor, Persia, and the greater part of northern and central Hindustan, and also the southeastern portion of Europe, as shown by the well-known story told by Herodotus of the attacks by lions on the camels which carried the baggage of the army of Xerxes on its march through the country of the Pæonians in Macedonia. The very circumstantial account of Herodotus shows that the animal at that time ranged through the country south of the Balkans, through Roumania to the west of the river Carasu, and through Thessaly as far south as the Gulf of Lepanto and the Isthmus of Corinth, having as its western boundary the river Potamo and the Pindus mountains. Fossil remains attest a still wider range, as it is shown in the same work that there is absolutely no osteological or dental character by which the well-known cave lion, so abundantly found in cave deposits of the Pleistocene age, can be distinguished from the existing *Felis leo*. There are also remains found in North America of an animal named *Felis atrox* by Leidy, which is attributed to the common lion; but, as they are very fragmentary, and as the specific characters by which most of the *Felidae* are distinguished are more dependent on external than on anatomical conformation, this determination cannot be so absolutely relied upon.

At the present day the lion is found in localities suitable to its habits, and where not exterminated (as it probably was in Europe) by the encroachments of man, throughout Africa from Algeria to the Cape Colony, and in Mesopotamia, Persia, and some parts of the northwest of India. According to Blanford, lions are still very numerous in the reedy swamps bordering the Tigris and Euphrates, and also occur on the west flanks of the Zagros mountains and the oak-clad ranges near Shiraz, to which they are attracted by the immense herds of swine which feed on the acorns. In India they appear now to be confined to the province of Kathiawar in Gujerat.

The great variations in external characters which different lions present, especially in the color and amount of mane, have given rise to the idea that there are several species, or at all events distinct varieties peculiar to different localities. It was at one time supposed that the lion of Gujerat differed essentially from that of Africa in the absence of mane, but subsequent evidence has not supported this view, which was probably founded upon young specimens having been mistaken for adults. Lions from that district as well as from Babylonia, which have lived in the gardens of the London Zoological Society, have had as fully developed mane as any other of the species. Mr. F. C. Selous has shown that in South Africa the so-called black-maned lion and

others with yellow scanty manes are found, not only in the same locality, but even among individuals of the same parentage.

The lion belongs to the very natural and distinctly defined group constituting the genus *Felis* of Linnæus (for the characters and position of which see article MAMMALIA), a genus held by Pallas and other philosophical naturalists as a model of what a genus ought to be, although recent writers have divided and subdivided it into as many as thirteen sections, on each of which a new generic term has been imposed. The usual color of the adult lion is yellowish-brown, but it may vary from a deep red or chestnut-brown to an almost silvery gray. The mane, as well as the long hair of the other parts of the body, sometimes scarcely differs from the general color, but it is usually darker and not infrequently nearly black. The mane begins to grow when the animal is about three years old, and is fully developed at five or six.

In size the lion is only equaled or exceeded by the tiger among the existing *Felidae*; though both species present great variations, the largest specimens of the latter appear to surpass the largest lions. A full-sized South African lion measures slightly less than ten feet from nose to tip of tail, following the curves of the body. The lioness is about a foot less.

The internal structure of the lion, except in slight details, resembles that of the other *Felidae*, the whole organization being that of an animal modified to fulfill, in the most perfect degree yet attained, an active, predaceous mode of existence. The teeth especially exemplify the carnivorous type in its highest condition of development. The most important function they have to perform, that of seizing and holding firmly animals of considerable size and strength, violently struggling for life, is provided for by the great, sharp-pointed and sharp-edged canines, placed wide apart at the angles of the mouth, the incisors between them being greatly reduced in size and kept back nearly to the same level, so as not to interfere with their action. The jaws are short and strong, and the width of the zygomatic arches and great development of the bony ridges on the skull, give ample space for the attachment of the powerful muscles by which they are closed. In the molar series of teeth the sectorial or scissor-like cutting function is developed at the expense of the tubercular or grinding, there being only one rudimentary tooth of the latter form in the upper jaw, and none in the lower. They are, however, sufficiently strong to break bones of large size. The tongue is long and flat, and remarkable for the development of the papillæ of the anterior part of the dorsal surface. They give the part of the tongue on which they occur the appearance and feel of a coarse rasp, and serve the purpose of such an instrument in cleaning the flesh from the bones of the animals on which the lion feeds. The vertebral column is composed of seven cervical, thirteen dorsal, seven lumbar, three sacral and about twenty-six caudal vertebrae. The clavicles are about three inches in length, imbedded loosely in the muscles, and not directly connected either with the sternum or the scapula. The limbs are digitigrade, the animal resting upon round, soft pads or cushions covered with thick, naked skin, one on the under surface of each of the principal toes, and one larger one of trilobed form, behind these, under the lower ends of the metacarpal and metatarsal bones, which are placed nearly vertically in ordinary progression. The fore feet have five toes, of which the third and fourth are nearly equal and longest, the second being slightly and the fifth considerably shorter. The hind feet have only four toes, the third and fourth being the longest, the second and fifth somewhat shorter and

nearly equal. The claws are all very large, strongly compressed, very sharp and exhibit the retractile condition in the highest degree, being drawn backward and upward into a cutaneous sheath by the action of an elastic ligament so long as the foot is in a state of repose, but exerted by muscular action when the animal strikes its prey. By this remarkable piece of animal mechanism their edges and points are always kept sharp and unworn.

The habits of the lion in a state of nature are fairly well known from the united observations of numerous travelers and sportsmen who have explored those districts of the African continent in which it is still common. It lives chiefly in sandy plains and rocky places interspersed with dense thorn-thickets, or frequents the low bushes and tall rank grass and reeds that grow along the sides of streams and near the springs where it lies in wait for the larger herbivorous animals on which it feeds. Although it is occasionally seen abroad during the day, especially in wild and desolate regions, where it is subject to but little molestation, the night is, as in the case of so many other predaceous animals, the period of its greatest activity.

The lion, as with other members of the feline family, seldom attacks his prey openly, unless compelled by extreme hunger. For the most part he steals upon it in the manner of a cat, or ambushes himself near to the water, or a pathway frequented by game. At such times he lies crouched upon his belly in a thicket until the animal approaches sufficiently near, when, with one prodigious bound, he pounces upon it. His food consists of all the larger herbivorous animals of the country in which he resides—buffaloes, various kinds of antelopes, zebras, giraffes, or even young elephants or rhinoceroses, though the adults of these latter he dare not attack. In cultivated districts the cattle, sheep, and even human inhabitants are never safe from his nocturnal ravages. He appears, however, as a general rule, only to kill when hungry or attacked, and not for the mere pleasure of killing, as with some other carnivorous animals. He, moreover, by no means limits himself to animals of his own killing, but, according to Selous, often prefers eating game that has been killed by man, even when not very fresh, to taking the trouble to catch an animal himself. All books of African travel and sport abound with stories, many of which are apparently well authenticated, of the lion's prodigious strength, as exemplified by his being able to drag off a whole ox in his mouth to a long distance, even leaping fences and dykes with it.

The lion appears to be monogamous, a single male and female continuing attached to each other irrespectively of the pairing season. At all events, the lion remains with the lioness while the cubs are young and helpless, and assists in providing her and them with food, and in educating them in the art of providing for themselves. The number of cubs at a birth is from two to four, usually three. They are said to remain with their parents till they are about three years old.

LIPARI ISLANDS. These islands, which take their name from the largest and most populous member of the group, are situated to the north of the eastern half of Sicily, between $38^{\circ} 20'$ and $38^{\circ} 55'$ N. latitude, and $14^{\circ} 15'$ and $15^{\circ} 15'$ E. longitude. The seven principal islands are Lipari, Salina, Vulcano, Stromboli, Panaria, Filicudi, and Alicudi; besides which there are ten islets, some of them mere rocks, the remains of a great central volcano now submerged. The total population of the islands is 18,400, and the area is less than fifty square miles.

LIPETSK, a district town of Russia, in the government of Tamboff, ninety-five miles west of the chief

town of the government, and twenty-three miles northwest of Gryazi railway junction, at the confluence of Lyesnoy Voronesh and Lipovka rivers. Population, 14,500.

LIPPE is the name of a territory in northwestern Germany, now divided into two small sovereign principalities, but formerly united under the same ruler. The name is derived from the river Lippe, which rises in the Teutoburgian Forest, and flows into the Rhine at Wesel.

I. LIPPE proper, also called **LIPPE-DETMOLD**, is bounded on three sides by the Prussian province of Westphalia, and on the east and northeast by Hanover, Pymont, and Hesse-Cassel. It also possesses three small enclaves in Westphalia. Its area is about 469 square miles. Population (1901), 138,952.

II. SCHAUMBURG-LIPPE, or **LIPPE-BÜCKEBURG**, to the north of Lippe-Detmold, consists of the western half of the old countship of Schaumburg, and is surrounded by Westphalia, Hanover, and the Prussian part of Schaumburg. The northern extremity of the principality, which is 175 square miles in extent, is occupied by a lake named the Steinhuder Meer. The great bulk of the population, which in 1901 amounted to 43,132, are Lutherans. The capital is Bückeburg, and Stadthagen is the only other town. Schaumburg-Lippe sends one deputy to the Federal Council, and has one vote in the Reichstag.

LIPPI, the name of three celebrated Italian painters.

I. FRA FILIPPO LIPPI, commonly called Lippo Lippi, one of the most celebrated painters of the Italian quattrocento, was born in Florence in 1412—his father, Tommaso, being a butcher. His mother died in his earliest infancy, and his father two years later. His aunt, a poor woman named Monna Lapaccia, then took charge of him; and in 1420, when only eight years of age, he was registered in the community of the Carmelite friars of the Carmine in Florence. Here he remained till 1432, and his early faculty for fine art was probably developed by studying from the works of Masaccio in the neighboring chapel of the Brancacci. Between 1430 and 1432 he executed some works in the monastery, which were destroyed by a fire in 1771; they are specified by Vasari, and one of them was particularly marked by its resemblance to Masaccio's style. Eventually Fra Filippo quitted his convent, but it appears that he was not relieved from some sort of religious vow; there is a letter of his, dated in 1439, in which he speaks of himself as the poorest friar of Florence, and says he is charged with the maintenance of six marriageable nieces. In 1452 he was appointed chaplain to the convent of S. Giovannino in Florence, and in 1457 rector of S. Quirico at Legnaia. Toward June, 1456, Fra Filippo was settled in Prato (near Florence) for the purpose of fulfilling an important commission which had been given him to paint frescoes in the choir of the cathedral. He set about painting, in 1458, a picture for the convent chapel of St. Margaret of Prato, and there saw Lucrezia Buti, the beautiful daughter of a Florentine, Francesco Buti; she was either a novice or a young lady placed under the nuns' guardianship. Lippi asked that she might be permitted to sit to him for the figure of the Madonna; he made passionate love to her, abducted her to his own house, and kept her there spite of the utmost efforts the nuns could make to reclaim her. The fruit of their loves was a boy, who became the painter, not less celebrated than his father, Filippino Lippi (noticed below). Lippi died in Spoleto, on or about October 8, 1469.

II. FILIPPINO or LIPPINO LIPPI (1460-1505) was the natural son of Fra Lippo Lippi and Lucrezia Buti, born in Florence and educated at Prato. Losing his

father before he had completed his tenth year, the boy took up his avocation as a painter, studying under Sandro Botticelli, and probably under Fra Diamante. The style which he formed was to a great extent original, but it bears clear traces of the manner both of Lippo and of Botticelli—more ornamental than the first, more realistic and less poetical than the second. His powers developed early; for we find him an accomplished artist by 1480, when he painted an altarpiece, the *Vision of St. Bernard*, now in the Badia of Florence; it is in tempera, with almost the same force as oil painting. Soon afterward, probably from 1482 to 1490, he began to work upon the frescoes which completed the decoration of the famous Brancacci chapel in the Carmine, commenced by Masolino and Masaccio many years before. He finished Masaccio's subject of the *Resurrection of the King's Son*, and was the sole author of *Paul's Interview with Peter in Prison*, the *Liberation of Peter*, the *Two Saints before the Proconsul*, and the *Crucifixion of Peter*. These works, were none others extant from his hand, are sufficient to prove that Lippino stood in the front rank of the artists of his time. In 1485 he executed the great altarpiece of the *Virgin and Saints*, with several other figures, now in the Uffizi Gallery. Another of his leading works is the altarpiece for the Nerli Chapel in S. Spirito—the *Virgin Enthroned*, with splendidly living portraits of Nerli and his wife, and a throned distance. In 1489 Lippino was in Rome, painting in the church of the Minerva, having first passed through Spoleto to design the monument for his father in the cathedral of that city. Some of his principal frescoes in the Minerva are still extant, the subject being in celebration of St. Thomas Aquinas. In 1496 Lippino painted the *Adoration of the Magi* now in the Uffizi, a very striking picture, with numerous figures. This was succeeded by his last important undertaking, the frescoes in the Strozzi Chapel, in the church of S. Maria Novella in Florence. Filippino, who had married in 1479, died in 1505 of an attack of throat disease and fever, aged only forty-five.

III. LORENZO LIPPI, a painter and poet, was born in Florence in 1606. He studied painting under Matteo Rosselli, the influence of whose style, and more especially of that of Santi di Tito, is to be traced in Lippi's works, which are marked by taste, delicacy, and a strong turn for portrait-like naturalism. He died of pleurisy in 1664.

LIPSIUS, JUSTUS, the Latinized form of Joest Lips, an eminent humanist of the sixteenth century, born October 18, 1547, at Overysse, a small village in Brabant. Sent early to the Jesuit college in Cologne, he was removed at seventeen to the university of Louvain by his parents.

Lipsius rushed into print at twenty with one of those volumes of miscellaneous remarks then in vogue, the dedication of which to Cardinal Granvella procured him an appointment as Latin secretary, and a visit to Rome in the retinue of the cardinal. Here Lipsius remained two years, using his spare time in study of the Latin classics, in viewing the monuments, collecting inscriptions, and handling MSS. in the Vatican. In 1570 he wandered over Burgundy, Germany, Austria, Bohemia, in search of learning and learned acquaintance, and was engaged for more than a year as teacher in the university of Jena, a position which implied an outward conformity to the Lutheran Church. On his way back to Louvain, he stopped some time at Cologne, where he must again have comported himself as a Catholic. He returned to Louvain, but was soon driven by the civil war to take refuge in Antwerp, where he received, in 1579, a call to the newly founded university of Leyden, as professor of history.

At Leyden, where he must have outwardly conformed to the Calvinistic creed and worship, Lipsius remained eleven years. The time at last arrived when Lipsius, who had always been somewhat ill at ease in his Calvinistic disguise, was to throw it off and return into the bosom of the church. In the spring of 1591 he left Leyden, under pretext of taking the waters at Spa for the relief of a liver complaint. He went to Mainz, where he was reconciled to the church by the instrumentality of the Jesuit fathers. The event was one which deeply interested the Catholic world, and invitations poured in on Lipsius from the courts and universities of Italy, Austria, and Spain. But he preferred to remain in his own country, and after two years of unsettled residence at Liège, Spa, etc., settled at Louvain, as professor of Latin in the Collegium Buslidianum. He was not expected to teach, and his trifling stipend was eked out by the appointments of privy counselor and historiographer to the king of Spain.

From this time till his death Lipsius continued to publish antiquarian collections and dissertations as before. He died at Louvain on March 23, 1606, at the age of fifty-nine. His Greek books and MSS. he left to the Jesuit college at Louvain.

LIQUEURS are perfumed and sweetened spirits prepared for drinking, and for use as a flavoring material in confectionery and cookery. The term liqueur is also applied to certain wines and spirits remarkable for their amount of bouquet, such as tokay and liqueur brandy, etc. Ordinary liqueurs consist of certain mixtures of pure spirit with essential oils and vegetable extracts, and with syrup of refined sugar. A certain number of such preparations have an established reputation; but the methods by which these are compounded, and the precise proportions of the various ingredients they contain, are valuable trade secrets, scrupulously kept from public knowledge.

Of trade liqueurs the most highly esteemed are Chartreuse, Curaçoa, Maraschino, and Doppel-Kümmel or Allasch. Of all kinds the most famous is *Chartreuse*, so called from being made at the famous Carthusian monastery near Grenoble. Three qualities are made—green, yellow, and white, the green being the richest and most delicate in flavor. Chartreuse is said to be a most complex product, resulting from the maceration and distillation of balm leaves and tops as a principal ingredient, with orange peel, dried hyssop tops, peppermint, wormwood, angelica seed and root, cinnamon, mace, cloves, Tonquin beans, *Calamus aromaticus*, and cardamoms. *Curaçoa*, which is a simple liqueur, is chiefly made in Amsterdam from the dried peel of the Curaçoa orange.

LIQUIDAMBAR, LIQUID AMBER, or SWEET GUM, is a product of a deciduous tree of from thirty to fifty feet high and attaining fifteen feet in circumference in Mexico, of which country it is a native, as well as of the greater portion of the United States. It bears palmately-lobed leaves, somewhat resembling those of the maple, but larger. The male and female inflorescences are on different branches of the same tree, the globular heads of fruit resembling those of the plane. This species is nearly allied to *L. orientalis*, Miller, a native of a very restricted portion of the southwest coast of Asia Minor, where it forms forests. It is from the bark of this latter tree that the storax of the ancients, the medicinal styrax of to-day, is prepared.

LIQUORICE. The hard and semi-vitreous sticks of paste, black in color and possessed of a sweet and somewhat astringent taste, known as liquorice paste or black sugar, are the inspissated juice of the roots of a leguminous plant, *Glycyrrhiza glabra*, the *radix glycyrrhizæ* of the pharmacopœia. The plant is cultivated

throughout the warmer parts of Europe, especially on the Mediterranean shores, and its geographical limits travel eastward throughout Central Asia to China, where its cultivation is also prosecuted. Liquorice has been known and its virtues appreciated from the most remote periods, and the root is an article of some commercial importance.

LIQUOR LAWS may be divided into the three great systems of free trade, restriction, and prohibition. The system of free trade may mean either that no special license is required by law for carrying on a traffic in intoxicating liquors, or that such a license is required, but that the licensing authority is bound to grant it in every case in which certain conditions are complied with. Wherever the determination of these conditions involves an appeal to the discretion of the licensing authority, the system of free trade tends to pass into the system of restriction. For practical purposes it does not matter much whether the law says, "every man of good character is entitled to a license for a properly constructed house in a suitable locality," or "the magistrate must consider the character of the applicant and of the premises, but is not bound to give reasons for his decision." But wherever the applicant can submit to a court capable of dealing with evidence the question of fact whether he has fulfilled certain conditions defined by law, the system of free trade may be said in theory to exist. Wherever, on the other hand, the law distinctly affirms an absolute discretion in the magistrate, or lays down a positive principle, such as the "normal number" or the fixed proportion between public houses and population, the system is properly described as restriction, or monopoly. This system, again, in its extreme form, tends to pass into one of prohibition. Under one of the alternative plans permitted by the Swedish licensing law of 1855, generally known as the Gothenburg plan, the municipality begins by the partial, and advances to the total, prohibition of liquor traffic, except by servants of the municipality; and this plan is sometimes advocated merely as a step toward the suppression of all trade in liquor. In nearly all countries the nature of the trade carried on in public houses has subjected them to a much more rigorous police supervision than ordinary trades. All trades, however, must be carried on under the conditions required by the public comfort and safety; and to give unlimited license in such matters to publicans would be to violate social rights not inferior to freedom of industry and trade.

Of recent years there has been a considerable increase in the amount of drunkenness in Europe generally. There are no means of determining the law of the increase by reliable statistics, but it seems probable that the increase is confined to the large towns and to the lowest classes. There has also been of late, both in the United Kingdom and on the Continent, a very earnest and animated discussion on the policy and results of the various systems of liquor law. It cannot be said that so far any decisive experience has been adduced on the subject. In fact the legislation of Europe is in a very uneasy and changeable state. Thus, prior to the federal constitution of 1874, the cantons of Switzerland were in the habit of directing the municipal authorities to observe a certain proportion between the number of licenses and the population. The new constitution, however, laid down the general principle of free trade, and the federal council intimated to the various cantons that it was no longer lawful to refuse a license on the ground that there was no public need of it. In the previous year precisely the opposite change took place in Denmark. The license system rested on the law of December 29, 1857, but this was modified by the law of

May 23, 1873, which increased the conditions to be fulfilled by those applying for a license, and conferred upon the communal authorities the power of fixing the maximum number of licenses to be granted. Similarly, in France, the liquor law rests upon the decree of 1851, but public opinion is turning against the absolute discretion reposed in the administrative authority, and the law proposed by M. de Gasté and approved of by the chamber of deputies on March 22, 1878, will probably lead to a system of greater freedom. In the German empire the various states are still permitted by a law of the confederation, dated June 21, 1869, to restrict the issue of licenses to what the public seem to require, but except in Württemberg this permission seems not to have been used. In Austria the rapid growth of drunkenness in Galicia made necessary the severe police law of July 19, 1877, but in other parts of the empire the exceptionally lenient law of December 20, 1859, seems to be considered sufficient. In the midst of so many fluctuations of opinion, the practical questions of legislation must be decided on general principles and not by experimental evidence. Those who speak and write on the reform of the liquor laws are divided into two great classes—(1) the nephalists, who consider alcohol, in every form, whether in distilled or in fermented liquors, to be poison, and therefore wish the sale of it to be entirely suppressed; (2) those who see no objection to moderate drinking, especially of the less alcoholic beverages, or at least regard the idea of suppression as an impracticable chimera. In the United Kingdom the nephalists are at present agitating for Sir Wilfrid Lawson's Permissive Bill, which has latterly taken the form of a local option resolution. This means that in each burgh or parish two-thirds of the ratepayers may decide that no licenses shall be given, a vote to be taken on the subject every three years. On March 17, 1879, the select committee of the House of Lords on intemperance reported emphatically against the scheme of the Permissive Bill.

Among those who are not nephalists a variety of schemes has been suggested. A small minority are in favor of free trade subject to certain conditions. An experiment of this kind was tried by the Liverpool magistrates in 1853. "The premises were to be of high ratable value; the excise duty was to be greatly increased; the licensee was invariably to reside on the premises, and a special police for the inspection of licensed houses was to be provided." These conditions being complied with, no license was refused. This experiment was made the subject of inquiry by Mr. Villier's select committee of 1854. That committee, which included Sir George Grey and Lord Sherbrooke (Mr. Lowe), reported unanimously in its favor. A similar experiment was made in Liverpool during the years 1862-66 without evil results, and also since 1862 in the Prescot division of the county of Lancashire. On the Continent the only countries where free trade prevails are Belgium, Holland, Greece, Spain, and Roumania. In certain parts of Bavaria communes possess breweries, the produce of which they are by custom entitled to sell without any license; and the Rhenish Palatinate has never been subject to the restrictions mentioned below which apply to the rest of the empire. In Belgium licenses are unknown. The only tax which the publican pays is the "patent," which is paid by every trade. So strong is the general law in Belgium that in 1866, when the municipal authorities of Antwerp issued a regulation prohibiting the sale of alcoholic drinks in the streets, this was held to be illegal by the court of cassation. The Dutch law is the same as in Belgium. It must not be supposed, however, that the Dutch are satisfied with the present law. The Dutch

"society for total abstinence from strong drink" is very active; and in 1880 the government presented to the lower chamber a bill introducing a license and also the principle of the normal number, the proportion of licenses to population varying according to the total population of towns. In Belgium the *Association contre l'abus des boissons alcooliques* is endeavoring to secure amendments of the law, chiefly of a fiscal and police character, but the introduction of the license is not suggested. In Germany, with the exception of Württemberg and those places where the license is unknown, the liquor trade is practically free. The law of 1869 declares that a license can be refused for two reasons only—if the police condemn the structure or situation of the premises, or if the applicant is likely to encourage drunkenness, gaming, reset of theft, or improper meetings. This system may be contrasted with those of Italy and Russia. In Italy, under the law of March 20, 1865, a license is obtained from the sub-prefect or *autorità politica del circondario* on the demand of the syndic (*sindaco*) of the commune and after consulting with the municipal *giunta*. In Russia, under the decree of 1861 and the communal law of June 28, 1870, the license is got from the municipal or communal council, or, in certain cases, from the owners of land, especially church land. In both countries the licensing authorities have unlimited discretion, which they have exercised so as to multiply public houses enormously. Assuming that sufficient guarantees can be got for the respectability of the applicant and the good sanitary condition of his premises, the system of free trade, or of unrestricted licensing on defined conditions, is the only one which can be defended on principle. It is impossible for the magistrates to exercise a just discretion in deciding what public houses are required for a locality. The fact that an applicant has invested capital in the business and is ready to begin is the best evidence that there is a demand to be supplied.

There is no question of social economics (not even excepting the land and labor questions) which has attracted more attention in the United States than that of the liquor traffic. It has entered into the field of politics, as may be seen in the history of the PROHIBITION PARTY (*q.v.*), and it has undoubtedly come there to stay. The extremist advocates of absolute prohibition liken their cause to the anti-slavery agitation and rank themselves with the early abolitionists. On the other hand the individualists hold the doctrine of non-interference to be supreme, while between these two and probably outnumbering all, the opportunists advocate a system of high license for the double object of raising municipal revenue and for stamping out the objectionable features of the traffic. A brief review of the legislation which has been had and of the present condition of the liquor laws is all that can be given here.

The evils arising from the excessive use of intoxicants are patent enough, and require no expatiation upon. For voluntary movements of individuals, working either alone or as organizations in the cause of temperance, and emphasizing precept by example, there can be nothing but praise. Within the present generation the temperance movement in its various forms has attained magnificent proportions, and particularly in its work among the young is its progress to be hailed with satisfaction.

The drinking customs of the last century, when a social gathering meant a debauch, and a funeral an orgie, have passed away. In America is found the most temperate people of the Anglo-Saxon race. In England malt liquors form a considerable part of the daily food of all classes, while in the United States water, tea, and coffee replace beer as a beverage taken with meals. On

the continent of Europe, where light wines are used by all classes the consumption of spirits is small, and it is only in northern climes that ardent spirits are freely consumed. But in the northern States of the Union, with a winter climate far more severe than that of the British Isles, the consumption of spirits is proportionately far less than in corresponding European latitudes.

Repressive legislation is the panacea of the Prohibition party. It was tried first in Maine, which State in 1851 adopted an absolutely prohibitory liquor law, which still remains in force. In 1884 the question of constitutional prohibition was submitted to the people, and was affirmed by a large majority. The Prohibition party had its origin at a convention held in Chicago in September, 1869. In 1872, 1876, 1880, 1884, and 1888 national conventions of the Prohibition party nominated candidates for the presidency and vice-presidency of the United States, the platform in each case being the outlawry of the liquor traffic. In 1888 the ticket received almost a quarter of a million votes, showing a great gain.

The spread of Prohibition in the States has been principally in those of the west. Iowa adopted a prohibitory constitutional amendment, which was declared by the State Supreme Court not to have complied with the constitutional forms. The legislature then provided by statute that wine, beer, and liquors should not be manufactured or sold, and this law still prevails. As a matter of fact, the law is only enforced in rural districts, where public opinion is favorable to its execution. In the river cities, where the population is largely of foreign birth, the law is simply ignored and without risk to its violators.

Kansas adopted a constitutional amendment which is still in force. But in this State, even more than in its neighbor, Iowa, illicit trade in liquor prevails to a great extent. In both States the result of prohibitive amendments and legislation has been to seriously disturb the political status. For example, Iowa is a State which has given 100,000 Republican majority for President. At the fall election of 1889 it elected a Democratic Governor, and tied the lower branch of the legislature. The cause of this was that the Prohibitionists (nearly all Republicans) insisted upon running their own candidates, and thus directly aided in the election of Democrats. In the year 1890 there was a movement inside the Republican party, both in Iowa and Kansas, for the re-submission to the people of the entire question.

An alternative for the absolute prohibition, by State law or constitutional provision, of the manufacture and sale of intoxicants is found in the so-called "local-option" laws. The meaning of local option is that county, city, or township divisions shall by a majority vote decide whether or not liquor shall be sold within the limits of their jurisdiction. Pennsylvania, Massachusetts, and other States have adopted this system. It is more in keeping with the purely democratic sentiment than the idea of State or National prohibition, but is equally open to the inherent objection to governmental interference and sumptuary laws. In 1889, the entire system of repressive legislation met with a series of defeats. In many States the principle of constitutional prohibition or the practice of local option was unfavorably pronounced upon. On the other hand the two divisions of Dakota, when admitted as States, incorporated prohibition in the organic law. A peculiar feature of the anti-liquor agitation is found in the "crusade movement" which some years ago swept through Ohio, Pennsylvania, and other States. Failing the power of law, the women (for the prohibition movement in its various forms is largely backed by women) decided to try the efficacy of prayer. Accompanied by brass bands and

armed with a consciousness of the right, the women of various cities formed themselves into praying bands and descended *en masse* on the liquor dealers. They kneeled on the dirty floors of the saloons and implored the saloon-keepers to go out of business. In some cases they bought out the saloon and turned it into a branch of the Young Men's Christian Association. In other instances their enthusiasm went so far as to induce them to start the bungs in the whisky barrels and spill the liquors in the gutters. The social "boycott" was also largely applied to those who asserted their right to drink or not as they pleased.

As opposed both to the Prohibitionists, to whom the sale of liquor is a device of Satan, and to the local-option advocates who think the liquor-trade should be subject to local legislation, there must be counted the vast body of citizens who hold that majorities have no more right to dictate what a man shall drink than to prescribe wherewithal he shall be clothed. It may be roundly stated that in the large cities, where sometimes a majority, and in all cases a large minority, are of foreign birth or extraction, anything which savors of sumptuary legislation is held in abhorrence. The cities are the homes of the "Personal Right" and "Personal Liberty" leagues, and these bodies, claiming to include as many truly temperate persons in their ranks as are to be found anywhere, set their faces against all restrictive legislation.

The remaining feature of importance is that which grows out of the economic question. In the first place the United States derives an enormous revenue each year from the ninety-cents per gallon tax on whisky, levied by the internal revenue department. In the second place the exigencies of municipal finance require that a large proportion of the expenses of government shall be provided for by license-fees levied on trades. The taxing of the retailing of intoxicants has always been a favorite source of revenue for fiscal purposes. Granted, say the municipal authorities, that the liquor trade is, *per se*, demoralizing. It must be granted that as it cannot possibly be suppressed in large cities, the best plan is to place it under stringent regulations and to extract from it a revenue which shall go toward paying the charges for the criminals made by it. It is an undoubted fact that the unregulated saloons of the lowest order are the nursing places of crime. To stamp these out, say the advocates of a license system, make the license fee for saloons so high that only the necessary saloons shall survive. Chicago, for example, tried this system several years ago. Formerly the license fee was but \$1 per week and the "dives" flourished. The city council fixed the license fee at \$500 per annum and the lower-class saloons were frozen out. The high-license system was adopted by many municipalities in Illinois and with good results. Attempts have been made to secure Federal legislation of a repressive character, but without success. The whole subject of liquor laws is in effect an unsettled one, and may so remain for years. It is one worthy of the best efforts of all good citizens to settle, and should be approached by all without prejudice and with an earnest desire to arrive at a conclusion which shall be for the benefit of all.

LISBON (Portuguese, *Lisboa*), the capital of the kingdom of Portugal, is situated on the northern bank of the Tagus (*Tejo*), at the spot where the river broadens to a width of nine miles, some eight or nine miles from the point where it enters the Atlantic. Standing on a range of low hills, backed by the lofty granite range of Cintra, and extending along the margin of the wide Tagus, Lisbon wears a noble aspect to those who approach it from the sea. In regard to beauty of position it may rightly

claim to be the third of European cities, Constantinople and Naples alone ranking before it. The river affords secure anchorage for a very large number of vessels, and the bar at the mouth is easily crossed even in rough weather. Like London, Paris, and Vienna, Lisbon stands in a geological basin of Tertiary formation. Lisbon stretches along the margin of the river for four or five miles, and extends northward over the hills for nearly three miles, but much of it is scattered among gardens and fields. In the older parts the streets are very irregular, but that portion which was rebuilt after the great earthquake of 1755 consists of lofty houses arranged in long, straight streets. Here are the four principal squares, the handsomest of which, the Praca do Commercio, is open on one side to the river, and on the other three is surrounded by the custom-house and government offices, with a spacious arcade beneath. In the middle is a bronze equestrian statue of Joseph I., in whose reign the earthquake and restoration of the city took place. At the middle of the north side is a grand triumphal arch, under which is a street leading to another handsome square, the Locio or Praca do Dom Pedro (built on the site of the Inquisition palace and prisons), where stands the theater of D. Maria II. The houses are for the most part well built, and are divided into flats for the accommodation of several families. The chief naval and military arsenals of the kingdom are at Lisbon. Attached to the former are a naval school and hydrographical office. The churches are numerous, but are nearly all in the same tasteless Italian style; the interiors, overlaid by heavy ornament, contain pictures utterly devoid of merit.

By far the most interesting architectural object at Lisbon is the unfinished Hieronymite church and monastery at Belem. The church was begun in 1500 near the spot where Vasco da Gama had embarked three years before on his famous voyage to India. The style is a curious mixture of Moorish Gothic and Renaissance, with beautiful details.

Lisbon is connected by railway with Madrid, and there is also a line northward to Coimbra and Oporto, as well as lines southward to Setubal, Evora, and Beja. Submarine cables connect it with England and with Brazil. There is communication by regular lines of steamers with the Portuguese islands in the Atlantic and the colonies in Africa, and with a great number of ports in Britain, continental Europe, and other parts of the world. Lisbon is the largest port in the kingdom, and its custom-house is a spacious and very substantial fire-proof building worthy of any capital in Europe, in which merchants are allowed to deposit their goods free of duty for a year, or for two years in the case of Brazilian produce. Upward of 1,400 foreign vessels, and about 1,100 Portuguese ships, including coasters, enter the port annually. Pop. of city (1900), 357,000.

The name Lisbon (Portuguese, *Lisboa*) is a modification of the ancient name Olisipo, also written Ulyssippo under the influence of a mythical story of a city founded by Ulysses in Iberia, which, however, according to Strabo, was placed by ancient tradition rather in the mountains of Turdetania. After the Romans the Goths and the Moslems successively became masters of the town and district. Under the latter the town bore in Arabic the name of Lashbāna, or Oshbāna. It was the first point of Moslem Spain attacked by the Normans in the invasion of 844. When Alphonso I. of Portugal took advantage of the decline and fall of the Almoravid dynasty to incorporate the provinces of Estremadura and Alentejo in his new kingdom, Lisbon was the last city of Portugal to fall into his hands, and yielded only after a siege of several months (October 21, 1147), with the aid of English and Flemish crusaders

who were on their way to Syria. In 1184 the city was again attacked by the Moslems under the powerful caliph Abu Ya'kub, but the enterprise failed. In the reign of Ferdinand I., the greater part of the town was burned by the Castilian army under Henry II. (1373), and in 1384 the Castilians again besieged Lisbon, but without success. Lisbon became the seat of an archbishop in 1390, the seat of government in 1422. It gained much in wealth and splendor from the maritime enterprises that began with the voyage of Vasco da Gama (1497). The patriarchate dates from 1716. From 1586 to 1640 Lisbon was a provincial town under Spain, and it was from this port that the Spanish Armada sailed in 1588. In 1640 the town was captured by the duke of Braganza, and the independence of the kingdom restored. For many centuries the city had suffered from earthquakes, of more or less violence, but these had been almost forgotten when, on November 1, 1755, it was reduced almost in an instant to a heap of ruins. A fire broke out to complete the work of destruction, and between 30,000 and 40,000 persons lost their lives. Pombal, an unscrupulous minister, but a man of great talent, applied himself with unremitting energy both to the protection of the rights of property (for the place was infested by bands of robbers) and to the reconstruction of the buildings. The handsomest part of the present city was erected under his direction, but even to this day there are edifices which speak forcibly of the great earthquake. In 1807 Napoleon proclaimed that the house of Braganza had ceased to reign in Europe, whereupon the regent Don John (his mother, the reigning queen Maria I., having become insane) thought it prudent to quit the country for Brazil, and next day a French army under Junot entered the city, possession of which he retained for ten months. He then quietly embarked his army under the protection of the inexplicable convention of Cintra so disgraceful to the English generals. In 1859 Lisbon was stricken by yellow fever, and many thousands were carried off before the plague was stayed. Lisbon boasts of having been the birthplace of St. Anthony, surnamed of Padua, of Camoens, the national epic poet (to whose honor a bronze statue has been placed in one of the squares), and of Pope John XXI.

LISBURN, a market town, cathedral city, and municipal and parliamentary borough of Ulster, Ireland, partly in Antrim and partly in Down, is situated in a beautiful and fertile district on the Lagan, and on the Ulster Railway, eight miles south-southwest of Belfast. Population (1901), about 12,000.

LISIEUX, capital of an arrondissement in the department of Calvados, France, 113 miles by rail west-northwest from Paris, and twenty-four miles east from Caen, is prettily situated on the Touques, at the point where it is joined by the Orbiquet, twenty-four miles above Trouville. The Paris and Caen Railway has a branch from Lisieux to Honfleur and Trouville, and another to Orbec. Population (1900), about 20,000.

LISKEARD, anciently LISCARRET, a market-town and municipal and parliamentary borough in the county of Cornwall, England, is situated twelve miles east of Bodmin, and 265 west-southwest of London by rail. Population, about 8,000.

LISLE, JOSEPH NICOLAS DE, astronomer, was born at Paris in 1688. He died in 1768.

LISMORE, an island of 9,600 acres, about ten miles long and averaging one and a half miles broad, with a population in 1881 of 630, lying southwest and northeast at the entrance of the Linnhe Loch in Argyllshire, Scotland.

LISMORE, a market-town and seat of a diocese, partly in Cork, but chiefly in Waterford, Ireland, is

beautifully situated on a steep eminence rising abruptly from the Blackwater, forty miles west-southwest of Waterford. Population, 2,000.

LISSA (in Polish, *Leszna*), a manufacturing town in the circle of Fraustadt, district of Posen, Prussia, is situated on the Breslau and Posen Railway, near the frontier of Silesia. Population, 12,000. Lissa was twice burned down (in 1656 and 1707) during the Swedish and Polish wars.

LISSA, an Austrian island in the Adriatic, nine miles long, with a greatest breadth of four miles, is situated forty-one miles from the coast of southern Dalmatia, almost due west of the mouth of the Narenta. "The shape is a long parallelogram with two breaks, the Porto di S. Giorgio (one of the finest harbors of refuge in the Adriatic) on the eastern short side, and the Valone di Comisa contained between two long prongs stretching due west and southwest." Population, 8,000.

LISTON, JOHN (born 1776, died 1846), comedian, was the son of a watchmaker in Soho, London.

LISTON, ROBERT, an eminent Scottish surgeon, was born in 1794, at Ecclefechan, where his father was parish minister. After eight years' study he began his career as a lecturer on anatomy and surgery in the Edinburgh School of Medicine; and in 1827 he was elected one of the surgeons to the Royal Infirmary. In 1835 he was invited to fill the chair of clinical surgery in University College, London. He held the appointment until his death, on December 7, 1847.

LITANY. This word is used by Eusebius and Chrysostom, most commonly in the plural, in a quite general sense, to denote a prayer, or prayers of any sort whatever, whether public or private; it is similarly employed in the law of Arcadius, which forbids heretics to hold assemblies in the city "in order to make litanies." But some trace of a more technical meaning is found in the epistle of Basil to the church of Neocæsarea, in which he urges, against those who were objecting to certain innovations, that neither were "litanies" used in the time of Gregory Thaumaturgus. The nature of the recently introduced litanies, which must be assumed to have been practiced at Neocæsarea in Basil's day, can only be vaguely conjectured.

As regards the form of words prescribed for use in these "litanies" or "supplications," documentary evidence is somewhat defective. Sometimes it would appear that the "procession" or "litany" did nothing else but chant "Kyrie eleison" without variation. There is no reason to doubt that from an early period the special written litanies of the various churches all showed the common features which are now regarded as essential to a litany, in as far as they consisted of invocations, deprecations, intercessions, supplications. But in details they must have varied immensely. The offices of the Roman Catholic Church at present recognize two litanies, the "Litanie majores" and the "Litanie breves," which differ from one another chiefly in respect of the fullness with which details are entered upon under each of the four heads mentioned above. The major litanies, as given in the Breviary, are at present appointed to be recited on bended knee, along with the penitential psalms, in all the six week days of Lent when ordinary service is held. Without the psalms they are said on the feast of Saint Mark and on the three rogation days. They are also chanted in procession before mass on Holy Saturday. The "litany" or "general supplication" of the Church of England, which is appointed "to be sung or said after morning prayer upon Sundays, Wednesdays, and Fridays, and at other times when it shall be commanded by the ordinary," closely follows the "Litanie majores" of the Breviary, the invocations of saints being of course

omitted.

LITCHFIELD, a thriving city of Montgomery county, Ill. It contains several churches and schools, a convent, two banks, two newspaper offices, and several flour mills and grain elevators. Population, 6,000.

LITHGOW, WILLIAM, a noted Scottish traveler, was born in Lanark, Scotland, about 1583, and died about 1660.

LITHIUM, one of the rarer metallic elements, intermediate in its character between sodium and barium. It was discovered in 1817 by Arfvedson. He recognized the presence in this mineral of a new kind of alkali, which Berzelius subsequently named "lithia," to denote its mineral origin. Lithia, though widely disseminated throughout the mineral world—traces of it being found in almost all alkaliferous silicates, in the soils derived from these, and in many mineral waters—nowhere occurs in any abundance, except in the immense masses of lithia-mica (lepidolite) known to exist in Bohemia. Of other lithia-minerals (all rare) we may name petalite and spodumene (both silicates of alumina and alkalies) and triphylline, a mixed phosphate of ferrous, manganous, and lithium oxides. Only lepidolite comes into consideration as a raw material for the preparation of lithia and its salts. But the extraction from it of pure lithia in any form is difficult.

Metallic Lithium, although long before known to exist, was successfully prepared for the first time in 1855, by Bunsen. Lithium is a silver-white metal of only .58 specific gravity (it floats on rock-oil), somewhat softer than lead, and like it susceptible of being pressed into wire. It tarnishes in air, though far less readily than sodium. When thrown upon water it gradually dissolves as hydrate, with evolution of hydrogen, but without fusing. The metal melts at $180^{\circ}\text{C}.$, and at a somewhat higher temperature takes fire and burns into oxide with a brilliant white flame.

LITHOGRAPHY. The principle upon which the art of lithography is based is very simple—the antagonistic qualities of grease and water. An unctuous composition is made to adhere to a peculiar kind of limestone; the parts thus covered acquire the power of receiving printing ink; the other parts are prevented from receiving it by the interposition of a film of water; and then by pressing paper strongly upon the stone impressions are obtained. There are two distinct branches in lithography—drawing and printing. Those practicing the first are known as lithographic *draughtsmen* or *writers*, the second as lithographic *printers*.

The art of lithography was discovered by Alois Senefelder, a native of Prague, born November, 6, 1771. His father, Peter Senefelder, was one of the performers of the Theater Royal, at Munich. The son Alois wished to follow the same profession, but, his father being opposed to this, he went to the university of Ingolstadt, and devoted himself to the study of jurisprudence. Owing to the death of his father shortly afterward, he was unable to continue his studies at the university, and, yielding to his old inclination, he tried to support himself as a performer and author, but without success. In order to accelerate the publication of one of his works, he frequently spent whole days in the printing-office, and thus became acquainted with all the particulars of the process of printing. It appeared so simple that he conceived the idea of purchasing a small printing press, thus enabling himself to print and publish his own compositions; but his means were inadequate, and to this circumstance we probably owe the invention of lithography. Unable to pay for the engraving of his compositions, he attempted to engrave them himself. He tried numerous experiments with little success; tools and skill were alike wanting. Copper-

plates were expensive, and the want of a sufficient number entailed the tedious process of grinding and polishing afresh those he had used. About this period his attention was accidentally directed to a fine piece of Kellheim stone which he had purchased for the purpose of grinding his ink. While he was engaged one day in polishing a stone slab on which to continue his exercises, his mother entered the room and desired him to write her a bill for the washer-woman, who was waiting for the linen. Neither paper nor ink being at hand, the bill was written on the stone he had just polished. The ink used was composed of wax, soap, and lamp-black. Some time afterward, when about to wipe the writing from the stone, the idea all at once struck him to try the effect of biting the stone with aquafortis. If the parts written on resisted its action, impressions might then be taken in the same way as from wood engravings. Surrounding the stone with a border of wax, he covered its surface with a mixture of one part of aquafortis and ten parts of water. The result of the experiment was that at the end of five minutes he found the writing elevated about the tenth part of a line ($\frac{1}{10}$ inch). He then proceeded to apply the printing ink to the stone, using at first a common printer's ball, but soon found that a thin piece of board covered with fine cloth answered better, communicating the ink more equally. He was able to take satisfactory impressions, and, the method of printing being new, he hoped to obtain a patent for it, or even some assistance from the government. For years Senefelder continued his experiments, until the art not only became simplified, but reached a high degree of excellence in his hands. In later years the king of Bavaria settled a handsome pension on Senefelder. He died at Munich in 1834, having lived to see his invention brought to comparative perfection.

LITHUANIANS, a people (about 3,000,000 in number) of Indo-European origin, which inhabits several western provinces of Russia and the northeastern parts of Poland and Prussia, on the shores of the Baltic Sea and in the basins of the Niemen and of the Duna. Very little is known about their origin, and nothing about the time of their appearance in the country they now inhabit. In the tenth century they were already known under the name of Litva, and, together with two other branches of the same stem—the Borussia and the Letts—they occupied the southeastern coast of the Baltic Sea from the Vistula to the Duna, extending northeast toward the Lakes Wierzi-yärvi and Peipus, southeast to the watershed between the affluents of the Baltic and those of the Black Sea, and south to the middle course of the Vistula—a tract bounded by Finnish tribes in the north, and by Slavonians elsewhere.

LITMUS, a coloring matter which occurs in commerce in the form of small blue tablets, which, however, consist mostly, not of the pigment proper, but of carbonate and sulphate of lime and other matter devoid of tinctorial value. Litmus is never used as a dye, but is extensively employed by chemists as a reagent for the detection of free acids and free alkalies.

LITTLE FALLS, a village and township in Herkimer county, N. Y., on the Erie canal, seventy-three and one-half miles west-northwest of Albany by the New York Central and Hudson River Railroad, at a point where the Mohawk river passes by a series of rapids through a picturesque defile. Little Falls has the largest cheese market in the United States. Population (1900), 10,381.

LITTLE ROCK, capital of the State of Arkansas as well as of Pulaski county, is situated on the south bank of the Arkansas river, about 250 miles from

its mouth, and near the center of the State. It derives its name from occupying the top of a rocky cliff about fifty feet in height, which is much less conspicuous than the precipitous cliffs that line the river just above the city. The river, which is navigable by large steamers to this point during two-thirds of the year, is crossed here by an iron drawbridge on the St. Louis, Iron Mountain and Southern Railway. Little Rock, founded in 1820, contains the State-house, the State asylums for the blind and for deafmutes, the State prison, the State library, St. John's Military College, and other schools. It is also the seat of the United States court of the eastern district of Arkansas, and a United States arsenal and land-office. Flour-mills, carriage-works, and foundries are among the chief industrial establishments. Population (1900), 38,307.

LITTLETON, THOMAS DE, of Frankley in Worcestershire, judge of the court of common pleas in the reign of Edward IV., and author of the well-known work on *Tenures*.

LITTRÉ, PAUL MAXIMILIEN ÉMILE, the compiler of the best dictionary of any living language, and the Frenchman of most encyclopædic knowledge since Diderot, was born at Paris on February 1, 1801. He determined to study medicine, and in 1822 entered his name as a student of medicine. He passed all his examinations in due course, and had only his thesis to prepare in order to obtain his degree as doctor when, in 1827, his father died, leaving his mother absolutely without resources. He at once renounced his degree, and, while attending the lectures of Rayer and taking a keen interest in medicine, began teaching Latin and Greek for a livelihood. He carried a musket on the popular side in the revolution of February, 1830, and was one of the national guards who followed Charles X. to Rambouillet. In 1831, when quite thirty years of age, he obtained an introduction to Armand Carrel, the editor of the *National*, who gave him the task of reading the English and German papers for excerpts. Carrel by the merest chance, in 1835, discovered the ability of his reader, who from that time became a constant contributor, and eventually director of the paper. In 1836 he began to contribute articles on all sorts of subjects to the *Revue des Deux Mondes*; in 1837 he married; and in 1839 appeared the first volume of his edition of the works of Hippocrates. This volume at once placed Littré in the forefront of the literary and scientific world; its ability was recognized by his election the same year into the Académie des Inscriptions et Belles-Lettres. At the age of thirty-eight then, he had won for himself a high reputation as a learned man of letters and of science. At this epoch he came across the works of Auguste Comte, the reading of which formed, as he himself said, "the cardinal point of his life," and from this time onward appears the influence of positivism on his own life, and, what is of even more importance, his influence on positivism, for he gave at least as much to positivism as he received from it. He brought to it a wide knowledge of science and literature, a great and growing reputation, and a clear head. He soon became an intimate friend of Comte's, and set to work to popularize his ideas in numerous works on the positivist philosophy, while at the same time continuing his edition of Hippocrates, which was not completed till 1862, publishing a similar edition of Pliny's *Natural History*, assisting after 1844 in the place of Fauriel at the committee engaged on the *Histoire littéraire de la France*, where his knowledge of the early French language and literature was invaluable, and contributing largely to the *National* and *Revue des Deux Mondes*. In the revolution of July, 1848, he took a keen interest, and himself took part in the repression of the ex-

treme republican party in June, 1849, under the banner of order. His essays, contributed during this period to the *National*, were collected together and published under the title of *Conservation, Révolution, et Positivisme* in 1852, and show, not only a lively faith in a good time coming, but a thorough acceptance of all the doctrines propounded by Comte. However, during the later years of his master's life, he began to perceive that he could not wholly accept all the dogmas or the more mystic ideas of his friend and master, but he studiously concealed his differences of opinion almost from himself, and Comte failed to see that his pupil had outgrown him, as he himself had outgrown his master, Saint-Simon. Comte's death in 1858 freed Littré from any fear of embittering his master's later years, and he published his own ideas in his *Paroles de la Philosophie Positive* in 1859, and at still greater length in his work on *Auguste Comte et la Philosophie Positive* in 1863.

In the year 1863, after completing his *Hippocrates* and his *Pliny*, he set to work on his great French dictionary, bringing to the task an unexampled knowledge of old French, of modern and classical languages, and of modern philology, which were to make his dictionary unique in its interest and accuracy. In the same year he was proposed for the Académie Française, but rejected, owing to the opposition of the fiery bishop of Orleans, who denounced him as the chief of the French materialists. He also at this time started with M. Wyruboff the *Philosophie Positive*, a review which was to embody the views of modern positivists, and to which he largely contributed. His life was thus absorbed in literary work, and flowed quietly on, till the overthrow of the empire called on him to take a part in politics. He felt himself too old to undergo the privations of the siege of Paris, and retired with his family to Brittany, whence he was summoned by M. Gambetta to Bordeaux, to lecture on history, and thence to Versailles to take his seat in the senate, to which he had been chosen by the department of the Seine. In December, 1871, he was elected a member of the Académie Française in spite of the renewed opposition of Mgr. Dupanloup, bishop of Orleans, who resigned his seat rather than receive him. His dictionary was completed in 1873, and he lived on full of years and honors, for in 1874 he was elected a life senator. The most notable of his productions in these latter years were his political papers attacking and unveiling the confederacy of the Orleanists and legitimists, and in favor of the republic, his republication of many of his old articles and books, among others the *Conservation, Révolution, et Positivisme* of 1852 (which he reprinted word for word, appending a formal, categorical renunciation of many of the Comptist doctrines therein contained), and a little tract, *Pour la dernière fois*, in which he maintained his unalterable belief in materialism. When it became obvious that the old man could not live much longer, his wife and daughter, who had always been fervent Catholics, strove to convert him to their religion. He had long interviews with Père Millériot, a celebrated controversialist, and was much grieved at his death; but it is hardly probable he would have ever been really converted. Nevertheless, when on the point of death, his wife had him baptized, and his funeral was conducted with the rites of the Catholic Church. He died June 2, 1881.

LITURGY. The word "Liturgy" technically denotes the "Order for the Celebration and Administration of the Eucharist." It has come to be used in a more popular sense to denote any or all of the various services of the Christian church, whether contained in separate volumes or bound up together in the form of a Book of Common Prayer. There are five main families or groups of liturgies, three of them Eastern in origin

and use, one Eastern in origin but Western in use, one Western both in origin and use. They are known either by the names of the apostles with whom they are traditionally connected, or by the names of the countries or cities in which they are known or believed to have been once or always in use.

The Prayer Book of the "Protestant Episcopal Church" in America was adopted by the General Convention of the American Church held in 1789. It is substantially the same as the English Book of Common Prayer, but among the more important variations we may name the following:—(a) The arrangement and wording of the communion office rather resembles that of the Scottish than of the Anglican liturgy, especially in the position of the oblation and invocation immediately after the words of institution; (b) the Magnificat, Nunc Dimittis, and Athanasian creed are disused; (c) ten selections of psalms are appointed to be used as alternatives for the psalms of the day. In addition to these there are various verbal and other unimportant alterations.

LIUTPRAND, Italian chronicler, was born toward the beginning of the tenth century, of a good Lombard family. The name is sometimes spelled Liudprand and even Luitprand. In 931 he entered the service of King Hugo of Italy as page; he afterward rose to a high position at the court of Hugo's successor Berengarius, having become chancellor, and having been sent (949) on an embassy to the Byzantine court. Falling into disgrace with Berengarius, he attached himself to the emperor Otto I., whom in 961 he accompanied into Italy, and by whom in 962 he was made bishop of Cremona. He was frequently employed in missions to the pope, and on two occasions (968–971) to Byzantium, to negotiate on behalf of the younger Otto (afterward Otto II.) for the hand of Theophano. Liutprand died in 972.

LIVERPOOL, a city and seaport of England, in the hundred of West Derby, in the county palatine of Lancaster, situated on the right bank of the estuary of the Mersey, about three miles from the open sea. The form of the city is that of an irregular semicircle, having the base line formed by the docks and quays extending about six miles along the east bank of the estuary, which here runs nearly north and south, and is about a mile in breadth. On the north the city is bounded by the borough of Bostle, along which the line of docks is continued. The area of the city is 5,210 acres.

The older parts of the town have at successive periods been entirely taken down and renovated. The streets of shops—Church Street, Bold Street, etc.—are equal in display to similar establishments in London. The commercial part of the city is remarkable for the number of palatial-looking piles of offices, built of hewn stone, principally in the Italian Renaissance style, among which the banks and insurance offices stand preëminent.

The public parks of Liverpool now form a prominent feature. The earliest, the Prince's Park, was laid out in 1843 by private enterprise. Sefton Park, the most extensive, containing about 400 acres, was commenced in 1865, and completed at a cost of \$4,500,000. A large portion of the land round the margin has been leased for the erection of villas. Wavertree, Newsham, Sheil, and Stanley Parks have also been constructed at the public expense. Connected with Wavertree Park are the botanic gardens, with the usual planthouses, and a large and lofty palmhouse. The suburbs are rapidly extending, and those on the south contain many good private residences. A boulevard, about a mile in length, planted with trees in the center, leads to the entrance to Prince's Park.

The public buildings of Liverpool are entitled to rank with those of cities of far larger population. The city possesses a magnificent town hall, built in 1754. St. George's Hall, finished in 1854, is unquestionably the finest building of the kind in existence. It contains an organ, the like of which is not to be found anywhere, and its great hall is probably the largest and best-constructed auditorium in England. The Exchange buildings form three sides of a quadrangle, of which the town hall completes the square. Three great trunk lines terminate here, and the city has direct communication with London, with the vast manufacturing district of Lancashire, and with Glasgow and Edinburgh. Up to 1850 Liverpool composed one ecclesiastical division, the largest in the kingdom. It now (1890) has over seventy churches, in addition to the mother-church of St. Mary's. Of the population at least one-fourth are Roman Catholics, of Irish descent, and the Catholic cathedral is one of the finest specimens of church architecture in England. Liverpool abounds in free libraries and picture galleries. Its college (university), founded in 1882, has an endowment of \$675,000. The city contains eight handsome theaters, and ranks with London as a dramatic center.

The docks and the commerce of Liverpool are the chief features of the city. Like the Clyde, the estuary of the Mersey was originally ill-adapted for commerce. Bristol was the port from which, for many years, the trade with Virginia was conducted.

The progress of the commerce of Liverpool during the present century is without a parallel. In 1800 the tonnage of ships entering the port was 450,060; in 1880 it reached 7,933,620 tons. In 1800 4,746 vessels entered, averaging 94 tons; in 1880 there were 20,249, averaging 440 tons. The only British port which can at all come into competition with Liverpool is London, the total trade of which, comprising exports and imports, amounted in 1880 to 16,479,108 tons, against 14,496,364 in Liverpool. A large proportion of this, however, is a coasting trade, indicated by the smaller size of the ships, averaging 240 tons each in London as compared with 440 tons in Liverpool. The coasting trade in Liverpool has rather fallen off, owing to the superior advantages of railway traffic. The proportion of steamers to sailing ships has very largely increased of late years. The return for 1881 gives 5,534,462 tons of steam navigation to 2,379,466 tons in sailing ships. If we take the value of the imports as a criterion, London is far in advance of Liverpool, the values in 1880 being \$707,214,535 and \$537,300,935, but the London imports consist, to a great extent, of very valuable commodities, such as tea, silk, indigo, wines, etc., while the Liverpool imports principally consist of grain, food, and raw produce, the materials for manufacture. If we look at the exports the balance is reversed, Liverpool in 1880 having exported the value of \$420,145,255, against \$263,004,600 from London. In the number of ships registered as belonging to the port, Liverpool stands first in the world, the tonnage belonging to Liverpool being 1,554,871, against 1,120,359 in London, and 1,005,894 in the whole of the ports on the Clyde.

The commerce of Liverpool extends to every part of the world, but probably the intercourse with America stands preëminent, there being five lines of steamers to New York alone, besides lines to Philadelphia, Boston, Halifax, Canada, New Orleans, etc. The size of the ships has greatly increased, having reached 8,000 tons burden, with 10,000 horse-power.

The imports into Liverpool comprise produce of every description from every region under the sun. Cotton, however, is the great staple, almost the whole trade of the commodity centering here. Grain comes

next, American and Australian corn occupying a large proportion of the market. Within the last few years an enormous trade in American provisions, including live cattle, has sprung up. Tobacco has always been a leading article of import into Liverpool, along with the sugar and rum from the West Indies. Timber, principally from Canada, forms an important part of the imports, the stacking yards extending for miles along the northern docks. At one time tea from China, and wool from Australia, promised to be imported with advantage, but the financial arrangements with London have drawn these trades almost entirely away. In regard to exports, Liverpool possesses decided advantages; lying so near the great manufacturing districts of Lancashire and the West Riding of Yorkshire, this port is the natural channel of transmission for their goods, and, if everything else fails, there are always coal and salt from Wales and Cheshire ready to make up a cargo. The consequence is that many ships, after discharging their homeward cargoes at London and the eastern ports, come round in ballast to Liverpool for an outward cargo.

The docks of Liverpool on both sides of the Mersey are under the same trust and management, and equally form part of the port of Liverpool. On the Liverpool side they extend along the margin of the estuary six and a quarter miles, of which one and one-quarter miles is in the borough of Bootle. The Birkenhead docks have not such a frontage, but they extend a long way backward. The water area of the Liverpool docks and basins is $333\frac{1}{2}$ acres, with a lineal quayside of twenty-two miles. The Birkenhead docks, including the great float of 120 acres, contain a water area of 160 acres, with a lineal quayside of nine miles.

The great landing stage of Liverpool is unique in its dimensions and utility. It was originally constructed in 1857, from the plans of Mr. J. Cubitt, and greatly enlarged and extended in 1874, making the entire cost \$1,865,000. The grand fabric had just been completed, and was waiting to be inaugurated by the duke of Edinburgh, when, on July 28, 1874, it accidentally caught fire, and, the timber being impregnated with creosote, the flames spread with unexampled rapidity, and in a few hours the whole was destroyed. It was again constructed with improvements. Its length is 2,063 feet, or about two-fifths of a mile, and its breadth eighty feet. It is supported on floating pontoons rising and falling with the tide, connected with the quay by seven bridges, besides a floating bridge for heavy traffic 550 feet in length. The southern half is devoted to the traffic of the Mersey ferries, of which there are eight—New Brighton, Egremont, Seacombe, Birkenhead, Tranmere, Rock Ferry, New Ferry, and Eastham. The northern half is used for sea-going steamers, and for the tenders of the great "liners." The warehouses for storing produce form a very prominent feature in the commercial part of the city. Down to 1841 these were entirely in private hands, distributed as chance might direct, but in that year a determined effort was made to construct docks with warehouses around on the margin of the quays. This met with considerable opposition from those interested, and led to a municipal revolution, but the project was ultimately carried out in the construction of the Albert dock and warehouses, which were opened by Prince Albert in 1845. Other docks since constructed have been similarly surrounded. The Albert warehouses form an immense pile standing between the dock and the river, imposing from their huge dimensions, but otherwise the very incarnation of bald ugliness.

Liverpool had a population (1901) of 684,947. It returns three members to Parliament.

LIVERPOOL, CHARLES JENKINSON, FIRST EARL

OF, was the eldest son of Colonel Jenkinson, Walcot, Oxfordshire, where he was born May 16, 1727. Almost immediately on entering parliament as member for Cockermouth in 1761, he was appointed under-secretary of state under Lord Bute, and, as he soon shared equally with that nobleman the favor of the king, his political advancement was rapid and uninterrupted while the friends of the king remained in office. By Grenville he was in 1763 appointed secretary of state; in the Grafton administration he, in 1766, obtained a seat at the Admiralty Board; and from 1778 to the close of Lord North's ministry he was secretary of war. On the accession of Pitt to power in 1784, he became president of the Board of Trade, retaining office till Pitt's resignation in 1801. Besides direct political power he also enjoyed a large share both of substantial and honorary political rewards. In 1773 he became member of the privy council, and obtained the vice-treasurership of Ireland, which he afterward exchanged for the clerkship of the pells; and from 1786 to 1802 he was chancellor of the duchy of Lancaster. In 1786 he was created Baron Hawkesbury, and ten years afterward earl of Liverpool. He died December 17, 1808. Lord Liverpool was generally believed to be the chief political adviser of George III.

LIVERPOOL, ROBERT BANKS JENKINSON, SECOND EARL OF, son of the above by his first wife Amelia, daughter of Mr. Watts, governor of Bengal, was born June 7, 1770. He was educated at Charterhouse and at Christ Church, Oxford, where he had Canning, afterward his close political associate, for a contemporary. In 1791 he entered parliament as member for Rye, but he first held office in 1801 as foreign secretary in Addington's administration, when he conducted the negotiations for the abortive treaty of Amiens. On the accession of Pitt to power in 1804, he obtained the home office, and till his elevation to the House of Peers he acted as leader of the party in the House of Commons. He declined the premiership on the death of Pitt in 1806, and remained out of office till the accession of Perceval in 1809, when he again became home secretary. After the assassination of Perceval in 1812 he became prime minister, and retained office till compelled, in February, 1827, to resign by the illness (paralysis) which terminated his life, December 4, 1828.

LIVERWORTS. The Liverworts or *Hepaticæ* constitute a group of the higher *Cryptogamia*, allied to the mosses. Their shoots are either *thalloid*, in some genera (*Marchantia*) highly differentiated in structure, in others (*Anthoceros*) of simple homogeneous texture, with an upper and lower surface, the latter fixed to the ground by capillary rootlets, and generally margined with minute scales; or they are *foliose*, the central stem bearing on each side a row of leaves, consisting of one series of cells invested with a structureless epidermis, and destitute of nerves, such as prevail in the leaves of mosses. Frequently on the inferior aspect a third row of leaf-like scales is found, differing from the former, and known as stipules, bracteoles, or amphigastria. Hence the shoots, although typically trilateral, often appear bilateral. The reproductive organs of the *Hepaticæ* are of two kinds—sexual and asexual.

LIVINGSTON, EDWARD, was born in Clermont, Columbia county, N. Y., May 26, 1764. He was a great-grandson of Robert Livingston, the first possessor under royal patent of "Livingston Manor," a tract of land on the Hudson, comprising the greater part of the present counties of Dutchess and Columbia. Having graduated at Princeton in 1781, he began to practice law in New York city, and rapidly rose to distinction as an advocate. He was a member of congress during 1794-98, and in 1801 was appointed United

States district attorney for the State of New York, and while retaining that position was also elected mayor of New York city, then an office of high dignity and emolument. In the summer of 1803 New York was visited with a violent epidemic of yellow fever, during which Livingston displayed great courage and energy in his endeavors to prevent the spread of the disease, and to relieve the widespread distress. He suffered an attack of the fever in its most violent form, during which the people of the city gave many proofs of their attachment and anxiety. He recovered to find his private affairs, which he had neglected, in some confusion, and he was at the same time deeply indebted to the government for public funds which had been lost through the mismanagement of a confidential clerk. Livingston at once surrendered all his property, and, having resigned his offices, removed to Louisiana, which had then just been ceded by France to the United States. He soon acquired a large law practice in New Orleans, and repaid the government in full. Almost immediately upon his arrival in Louisiana he was appointed by the legislature to prepare a provisional code of judicial procedure, which was continued in force from 1805 to 1825. During the short war with England in 1814-15, Livingston was active in rousing the mixed population of New Orleans to resistance, and acted as adviser and aide-de-camp to Jackson. In 1821, by appointment of the legislature, Livingston began the preparation of a new code of criminal law and procedure, since widely known in Europe and America as the "Livingston Code." It was prepared in both French and English, as required by the necessities of the practice in Louisiana, and, though substantially completed in 1824, and in greater part then adopted by the State, it was not printed entire until 1833. It was at once reprinted in England, France, and Germany, attracting wide interest and praise from the most distinguished sources by its remarkable simplicity and vigor, and more especially by reason of its philanthropic provisions, which have noticeably influenced the penal legislation of several countries. Livingston was a member of congress during 1823-29, was afterward senator, and for two years secretary of state under President Jackson. From 1833 to 1835 he was minister plenipotentiary to France, and conducted with success negotiations of considerable difficulty and importance. He died May 23, 1836.

LIVINGSTON, ROBERT R., American statesman, brother of Edward Livingston noticed above, was born at New York, November 27, 1746. He graduated at King's College, New York, at the age of nineteen, became a practitioner of law, and, in 1773, recorder of the city, but was soon displaced by loyalist influence because of his sympathies with the Revolution. In 1776 he was a member of the committee of congress which drew up the Declaration of Independence, and in 1777 was a prominent member of the convention at Kingston, which framed the first constitution of New York. Upon the adoption of that instrument in the same year, he became the first chancellor of the State, which office he held until 1801, whence he is best known as "Chancellor" Livingston. He administered the oath of office to Washington at his first inauguration to the presidency in New York, April 30, 1789. In 1801 he was appointed by President Jefferson as minister to France, and in 1803 effected in behalf of his government the purchase from France of the vast territory then known as Louisiana, comprising the entire territory between the Mississippi and the Rocky Mountains, from the Spanish to the British possessions. This was, perhaps, the most important transfer of territory by purchase ever made, but none of those who participated in it realized its im-

portance. Napoleon's agent obtained 10,000,000 francs more than he had been instructed to accept for the cession, and Jefferson and Livingston were at the time bitterly censured for rashly concluding so useless a purchase. In 1804 Livingston withdrew from public life, and, after spending a year in travel in Europe, returned to New York, where he occupied his remaining years in promoting various improvements in agriculture. He also assisted Fulton in his invention of the steamboat. He died in February, 1813.

LIVINGSTONE, DAVID, missionary and explorer, was born on March 19, 1813, in Lanarkshire, Scotland. David was the second child of his parents, Neil Livingston (for so he spelled his name, as did his son for many years) and Agnes Hunter. His parents were poor and self-respecting, typical examples of all that is best among the humbler families of Scotland. At the age of ten years David left the village school for the neighboring cotton-mill, and by strenuous efforts he qualified himself at the age of twenty-three to undertake a college curriculum. He attended, for two sessions, the medical and the Greek classes in Anderson's College, and also a theological class. In September, 1838, he went up to London, and was accepted by the London Missionary Society as a candidate. During the next two years he resided mostly in London, diligently attending medical and science classes.

He took his medical degree in the Faculty of Physicians and Surgeons in Glasgow in November, 1840. Livingstone had from the first set his heart on China, and it was a great disappointment to him that the society finally decided to send him to Africa.

Livingstone sailed from England on December 8, 1840. From Algoa Bay he made direct for Kuruman, the mission station, 700 miles north, established by Hamilton and Moffat thirty years before, and there he arrived on July 31, 1841. The next two years Livingstone spent in traveling about the country to the northward, in search of a suitable outpost for settlement. During these two years he had already become convinced that the success of the white missionary in a field like Africa is not to be reckoned by the tale of doubtful conversions he can send home each year—that the proper work for such men was that of pioneering, opening up and starting new ground, leaving native agents to work it out in detail. The whole of his subsequent career was a development of this idea. He selected the valley of Mabotsa, on one of the sources of the Limpopo river, 200 miles northeast of Kuruman, as his first station. It was shortly after his settlement here that he was attacked by a lion which crushed his left arm, and nearly put an end to his career. The arm was imperfectly set, and it was a source of trouble to him at times throughout his life, and was the means of identifying his body after his death. To a house, mainly built by himself at Mabotsa, Livingstone, in 1844, brought home his wife, Mary Moffat, the daughter of Moffat of Kuruman. Here he labored till 1846, when he removed to Chonuanane, forty miles further north, the chief place of the Bakwain tribe under Sechele. In 1847 he again removed to Kolobeng, about forty miles westward, the whole tribe following their missionary. With the help of and in the company of two English sportsmen, Mr. Oswell and Mr. Murray, he was able to undertake a journey of great importance to Lake Ngami, which had never yet been seen by a white man. Crossing the Kalahari Desert, of which Livingstone gave the first detailed account, they reached the lake on August 1, 1849. In April next year he made an attempt to reach Sebituane, who lived 200 miles beyond the lake, this time in company with his wife and children, but again got no further than the lake, as the children were seized with fever. A year

later, April, 1851, Livingstone, again accompanied by his family and Mr. Oswell, set out, this time with the intention of settling among the Makololo for a period. At last he succeeded, and reached the Chobe, a southern tributary of the Zambesi, and in the end of June discovered the Zambesi itself at the town of Sesheke. Leaving the Chobe on August 13th, the party reached Cape Town in April, 1852. Livingstone may now be said to have completed the first period of his career in Africa, the period in which the work of the missionary had the greatest prominence. Henceforth he appears more in the character of an explorer, but it must be remembered that he regarded himself to the last as a pioneer missionary, whose work was to open up the country to others.

Livingstone left the Cape on June 8, 1852, and reached Linyanti, the capital of the Makololo, on the Chobe, on May 23, 1853, was received in royal style by Sekeletu, and welcomed by all the people. His first object in this journey was to seek for some healthy high land in which to plant a station. Ascending the Zambesi, he, however, found no place free from the destructive tsetse insect, and therefore resolved to discover a route to the interior from either the west or east coast. To accompany Livingstone in his hazardous undertaking, twenty-seven men were selected from the various tribes under Sekeletu, partly with a view to open up a trade route between their own country and the coast. The start was made from Linyanti on November 11, 1853, and, by ascending the Leeba, Lake Dilolo was reached on February 20, 1854. On April 4th the Coango was crossed, and on May 31st the town of Loanda was entered, much to the joy of the men—their leader, however, being all but dead from fever, semi-starvation and dysentery. Livingstone speaks in the warmest terms of the generosity of the Portuguese merchants and officials. From Loanda Livingstone sent his astronomical observations to Maclear at the Cape, and an account of his journey to the Royal Geographical Society, which in May, 1855, awarded him its highest honor, its gold medal. Loanda was left on September 20, 1854, but Livingstone lingered long about the Portuguese settlements. Making a slight detour to the north to Cabango, the party reached Lake Dilolo on June 13th. Here Livingstone made a careful study of the watershed of the country in what is perhaps the most complicated river system in the world. He now for the first time apprehended the true form of the river systems and the continent, and the conclusions he came to have been essentially confirmed by subsequent observations. The return journey from Lake Dilolo was by the same route as that by which the party came. Their reception all along the Barotse valley was an ovation, and Linyanti was reached in the beginning of September.

For Livingstone's purposes the route to the west was unavailable, and he decided to follow the Zambesi to its mouth. With a numerous following he left Linyanti on November 8, 1855. A fortnight afterward he made the great discovery with which, in popular imagination, his name is more intimately associated than with anything else he did—the famous "Victoria" falls of the Zambesi, which, after a second examination in his subsequent journey, he concluded to be due to an immense fissure or fault right across the bed of the river, which was one means of draining off the waters of the great lakes that he supposed must have at one time occupied the center of the continent. Livingstone reached the Portuguese settlement of Tette on March 2, 1856, in a very emaciated condition, and, after six weeks, left his men well cared for and proceeded to Kilimane, where he arrived on May 20th, thus having completed in two years and six months one of the most remarkable

and fruitful journeys on record. When Livingstone began his work in Africa it was virtually a blank from Kuruman to Timbuctoo, and nothing but envy or ignorance can throw any doubt on the originality of his discoveries.

On December 12th he arrived in England, after an absence of sixteen years, and met everywhere with the welcome of a hero. He told his story in his *Missionary Travels and Researches in South Africa* (1857) with straightforward simplicity, and with no effort after literary style, and no apparent consciousness that he had done anything extraordinary. Its publication brought what he would have considered a competency had he felt himself at liberty to settle down for life. In 1857 he severed his connection with the London Missionary Society, with whom, however, he always remained on the best of terms, and in February, 1858, he accepted the appointment of "Her Majesty's consul at Kilimane for the eastern coast and the independent districts in the interior, and commander of an expedition for exploring eastern and central Africa."

The Zambesi expedition, of which Livingstone thus became commander, sailed from Liverpool in H.M.S. *Pearl* on March 10, 1858, and reached the mouth of the Zambesi on May 14th, and the party ascended the river from the Kongone mouth in a steam launch, the *Ma-Robert*, reaching Tette on September 8th. The remainder of the year was spent in examining the river Tette, and especially the Kebrabasa rapids. Most of the year 1859 was spent in the exploration of the river Shire and Lake Nyassa, which was discovered in September; and much of the year 1860 was spent by Livingstone in fulfilling his promise to take such of the Makalolo home as cared to go. In January of next year arrived Bishop Mackenzie and a party of missionaries sent out by the Universities Mission to establish a station on the upper Shire.

After exploring the river Rovuma for thirty miles in his new vessel, the *Pioneer*, Livingstone and the missionaries proceeded up the Shire to Chibisa's; there they found the slave trade rampant, desolating the country and paralyzing all effort. On July 15th Livingstone, accompanied by several native carriers, started to show the bishop the country. Several bands of slaves whom they met were liberated, and after seeing the missionary party settled in the highlands of Magomero to the south of Lake Shirwa, Livingstone spent from August to November in exploring Lake Nyassa. While the boat sailed up the west side of the lake to near the north end, the explorer marched along the shore. He returned more resolved than ever to do his utmost to rouse the civilized world to put down the desolating slave-trade. On January 30, 1862, at the Zambesi mouth, Livingstone welcomed his wife and the ladies of the mission, with whom were the sections of the *Lady Nyassa*, a river steamer, which Livingstone had had built at his own expense, absorbing most of the profits of his book, and for which he never got any allowance. When the mission ladies reached the mouth of the Ruu tributary of the Shire, they were stunned to hear of the death of the bishop and Mr. Burrup. This was a sad blow to Livingstone, seeming to have rendered all his efforts to establish a mission futile. A still greater loss to him was that of his wife at Shupanga, on April 27, 1862.

The *Lady Nyassa* was taken to the Rovuma. Up this river Livingstone managed to steam 156 miles, but further progress was arrested by rocks. Returning to the Zambesi in the beginning of 1863, he found that the desolation caused by the slave trade was more horrible and widespread than ever. It was clear that the Portuguese officials were themselves at the bottom of the

traffic. Kirk and Charles Livingstone being compelled to return to England on account of their health, the doctor resolved once more to visit the lake, and proceeded some distance up the west side and then north-west as far as the watershed that separates the Loangwa from the rivers that run into the lake. Meanwhile a letter was received from Earl Russell, recalling the expedition by the end of the year. In the end of April, 1864, Livingstone reached Zanzibar in the *Lady Nyassa*, and on the 30th he set out with nine natives and four Europeans for Bombay, which was reached after an adventurous voyage of a month, and on July 23d Livingstone arrived in England.

By Murchison and his other staunch friends Livingstone was as warmly welcomed as ever. When Murchison proposed to him that he should go out again, although he seems to have had a desire to spend the remainder of his days at home, the prospect was too tempting to be rejected. He was appointed H. M. consul to central Africa without a salary, and the government contributed only \$2,500 to the expedition. The chief help came from private friends. During the latter part of the expedition government granted him \$5,000, but that, when he learned of it, was devoted to the great undertaking. The Geographical Society contributed \$2,500. The two main objects of the expedition were the suppression of slavery by means of civilizing influences, and the ascertainment of the watershed in the region between Nyassa and Tanganyika. At first Livingstone thought the Nile problem had been all but solved by Speke, Baker, and Burton, but the idea grew upon him that the Nile sources must be sought further south, and his last journey became in the end a forlorn hope in search of the "fountains" of Herodotus. Leaving England in the middle of August, 1865, *via* Bombay, Livingstone arrived at Zanzibar on January 28, 1866. He landed at the mouth of the Rovuma on March 22d, and started for the interior on April 4th. His company consisted of thirteen sepoys, ten Johanna men, nine African boys from Nassick school, Bombay, and four boys from the Shire region, besides camels, buffaloes, mules, and donkeys. This imposing outfit soon melted away to four or five boys. Rounding the south end of Lake Nyassa, Livingstone struck in a north-northwest direction for the south end of Lake Tanganyika, over country much of which had not previously been explored. The Loangwa was crossed on December 15th, and on Christmas day Livingstone lost his four goats, a loss which he felt very keenly, and the medicine chest was stolen in January, 1868. Fever came upon him, and for a time was his almost constant companion; this, with the fearful dysentery and dreadful ulcers and other ailments which subsequently attacked him, and which he had no medicine to counteract, no doubt told fatally on even his iron frame. The Chambeze was crossed on January 28th, and the south end of Tanganyika reached March 31st. Here, much to his vexation, he got into the company of Arab slave dealers, by whom his movements were hampered; but he succeeded in reaching Lake Moero. After visiting Lake Mofwa and the Lualaba, which he believed was the upper part of the Nile, he, on July 18th, discovered Lake Bangweolo. Proceeding up the west coast of Tanganyika, he reached Ujiji on March 14, 1869, "a ruckle of bones." Supplies had been forwarded to him at Ujiji, but had been knavishly made away with by those to whose care they had been intrusted. Livingstone recrossed Tanganyika in July, and through the country of the Manyema he tried in vain, for a whole year, to reach and cross the Lualaba, baffled partly by the natives, partly by the slave hunters, and partly by his long illnesses. It was, indeed, not till March 29, 1871, that he succeeded in reaching the

Lualaba, at the town of Nyangwe, where he stayed four months, vainly trying to get a canoe to take him across. It was here that a party of Arab slavers, without warning or provocation, assembled one day when the market was busiest and commenced shooting down the poor women, hundreds being killed or drowned in trying to escape. Livingstone had "the impression that he was in hell," but was helpless, though his "first impulse was to pistol the murderers." The account of this scene which he sent home roused indignation in England to such a degree as to lead to determined and to a considerable extent successful efforts to get the sultan of Zanzibar to suppress the trade. In sickened disgust the weary traveler made his way back to Ujiji, which he reached on October 13th. Five days after his arrival in Ujiji he was cheered and inspired with new life, and completely set up again, as he said, by the timely arrival of Mr. H. M. Stanley, the richly laden almoner of Mr. James Gordon Bennett, of the New York *Herald*. Mr. Stanley's residence with Livingstone was almost the only bright episode of these last sad years. With Stanley, Livingstone explored the north end of Tanganyika, and proved conclusively that the Lusize runs into and not out of it. In the end of the year the two started eastward for Unyanyembe, where Stanley provided Livingstone with an ample supply of goods, and bade him farewell. Stanley left on March 15, 1872, and after Livingstone had waited wearily at Unyanyembe for five months, a troop of fifty-seven men and boys arrived, good and faithful fellows on the whole, selected by Stanley himself. Thus attended, he started on August 15th for Lake Bangweolo, proceeding along the east side of Tanganyika. His old enemy, dysentery, soon found him out. In January, 1873, the party got among the endless spongy jungle on the east of Lake Bangweolo, Livingstone's object being to go round by the south and away west to find the "fountains." Vexatious delays took place, and the journey became one constant wade below, under an almost endless pour of rain from above. The doctor got worse and worse, but no idea of danger seems to have occurred to him. At last, in the middle of April, he had unwillingly to submit to be carried in a rude litter. On April 29th Chitambo's village on the Lulimala, in Ilala, on the south shore of the lake, was reached. The last entry in the journal is April 27th:—"Knocked up quite, and remain—recover—sent to buy milch goats. We are on the banks of the Molilamo." On April 30th he with difficulty wound up his watch, and early on the morning of May 1st the boys found "the great master," as they called him, kneeling by the side of his bed, dead. His faithful men preserved the body in the sun as well as they could, and, wrapping it carefully up, carried it and all his papers, instruments, and other things, across Africa to Zanzibar. It was borne to England with all honor, and on April 18, 1874, was deposited in Westminster Abbey, amid tokens of mourning and admiration such as England accords only to her greatest sons. Government bore all the funeral expenses. His faithfully kept journals during these seven years' wanderings were published under the title of the *Last Journals of David Livingstone in Central Africa*, in 1874, edited by his old friend, the Rev. Horace Waller.

LIVIUS ANDRONICUS occupies the position of the oldest among the recognized poets of Rome. He determined the course which Roman literature followed for more than a century after his time. The imitation of Greek comedy, tragedy, and epic poetry, which produced great results in the hands of Nævius, Plautus, Ennius, and their successors, received its first impulse from him. To judge, however, by the very insignificant

remains of his writings, and by the testimonies of Cicero and Horace to his merits, he can have no pretension either to original genius or to artistic accomplishment. His real claim to distinction was that he was the first great schoolmaster of the Roman people, and the first acknowledged medium through which the genius of Greece acted on the Roman mind, and found for itself a rude expression in the Latin language.

LIVNY, a district town of Russia, in the government of Orel, eighty-seven miles east-southeast of the chief town of the government, at the confluence of the rivers Livenka and Sosna. Population, 13,000.

LIVONIA, or LIVLAND, one of the three Baltic provinces of Russia, is bounded by the Gulf of Riga on the west, Esthonia on the north, the governments of St. Petersburg, Pskov, and Vitebsk on the east, and Courland on the south. A group of islands, situated at the entrance of the Gulf of Riga, of which Ösel Mohn, Runo, and Paternoster are the largest, belong to this government. It covers, with the islands, a surface of 18,160 square miles, but of this the part of Lake Peipus, or Tchudskoye, which belongs to it occupies 10,090. Population (1898), 1,300,640.

LIVY, the Roman historian, belonged by birth to those regions of northern Italy which had already given to Roman literature Catullus, Cornelius Nepos, and Virgil. He was born in 59 B.C., the year of Cæsar's first consulship, and was eleven years younger than Virgil and six years younger than Horace. His native city Padua (Patavium) could challenge comparison, in the days of Augustus, even with such great centers of industry as Alexandria or Gades; and, while its active municipal life and long traditions of hard-won independence may have quickened Livy's sympathies with republican freedom, its ancient connection with Rome naturally helped to turn his attention to the study which became the work of his life. For Padua claimed, like Rome, a Trojan origin, and Livy is careful to place Antenor, the founder of Padua, side by side with Æneas.

Livy's easy, independent life at Rome, and his aristocratic leanings in politics, have been taken as proof that he was the son of well-born and opulent parents; and it is certain that he was able to afford the luxury of a good education, for he was widely read in Greek literature, and a student both of rhetoric and philosophy. We have also evidence in his writings that he had prepared himself for his great work by researches into the history of his native town. His youth and early manhood, spent perhaps chiefly at Padua, were cast in stormy times, and the impression which they left upon his mind was ineffaceable. He was ten years old when Cæsar crossed the Rubicon and civil war began. In his fifteenth year came the murder of the great dictator, of whom he afterward declared that he knew not "whether it were better for him to have been born or not," and one year later the murder of Cicero, to whose memory he paid an eloquent tribute. Of the part taken by Padua in the troubles which distracted the empire from 49 B.C. till the decisive victory at Actium we know nothing beyond the fact that in 43 B.C. it closed its gates against Antony, and was afterward punished for doing so by Asinius Pollio. Livy's personal sympathies were with Pompey and the republican party; but far more lasting in its effects was his experience of the license, anarchy, and confusion of these dark days. The rule of Augustus seems to have accepted as a necessity, but he did not, like Horace and Virgil, welcome it as inaugurating a new and glorious era. While he endeavored to stifle his recollections of the horrors he had witnessed, by fixing his whole mind on older and better times, he writes of the present with despondency as a degenerate and declining age; and, instead of triumphant prophe-

cies of world-wide rule, such as we find in Horace, Livy contents himself with pointing out the dangers which already threatened Rome, and exhorting his contemporaries to learn, in good time, the lessons which the past history of the state had to teach.

It was probably about the time of the battle of Actium that Livy established himself in Rome, and there he seems chiefly to have resided until his retirement to Padua shortly before his death. We have no evidence that he traveled much, though he must have paid at least one visit to Campania, and he never, so far as we know, took any part in political life. Nor, though he enjoyed the personal friendship and patronage of Augustus, and stimulated the historical zeal of the future emperor Claudius, can we detect in him anything of the courtier. There is not in his history a trace of that rather gross adulation in which even Virgil does not disdain to indulge. His republican sympathies were freely expressed, and, it should be added, as freely pardoned by Augustus. As his work went on, the fame which he had never coveted came to him in ample measure. He is said to have declared in one volume of his history that he had already won glory enough, and the younger Pliny relates that a Spaniard came all the way from Gades merely to see him, and, this accomplished, at once returned home satisfied. The accession of Tiberius materially altered for the worse the prospects of literature in Rome, and Livy may have feared for himself the fate which afterward befell Cremutius Cordus, who was tried before the senate, for having in his annals spoken of Brutus and Cassius as the last of the Romans. However this may have been, Livy retired to Padua, and died there in the third year of the reign of Tiberius (17 A.D.), at the ripe age of seventy-six.

LIZARD. The name Lizard (Lat., *lacerta*) originally referred only to the small European species of four-legged reptiles, but is now applied to a whole order (*Lacertilia*) which is represented by numerous species in all temperate and tropical parts of the globe. Lizards may be described as reptiles with a more or less elongate body terminating in a tail, and with the skin either folded into scales (as in snakes) or granular or tubercular; legs are generally present—usually four, rarely two in number—but sometimes they are reduced to rudiments or entirely hidden below the skin; the jaws are toothed, and the two mandibles firmly united in front by an osseous suture. Eyelids are generally present. The vent is a transverse slit, and not longitudinal as in Crocodilians. Other structural characteristics, especially of the skeleton, separate lizards from the other orders of reptiles; but will be better understood if described in relation to the other members of that class. (See REPTILES.)

At a low estimate the number of described species of lizards may be given as about 1,700. They are extremely scarce north of 60° N. latitude; and in the southern hemisphere the southern point of Patagonia forms the furthest limit of their range. As we approach the tropics, the variety of forms and the number of individuals increase steadily, the most specialized and the most developed forms (the monitors and leguans) being restricted to the tropical regions where lizards abound. They have adapted themselves to almost every physical condition, except the extreme cold of high latitudes or altitudes. Those inhabiting temperate latitudes hibernate. The majority live on broken ground, rocks with or without vegetation; others are arboreal; to a few (certain monitors) the neighborhood of water is a necessity; while others are true desert animals, in color scarcely distinguishable from their surroundings. Some, like many geckos, live near or in houses, being enabled by a peculiar apparatus of their toes to run along perpendicular and even over-

hanging surfaces. No lizard enters the sea, with the exception of one species, the leguan of the Galapagos (*Amblyrhynchus*), which feeds on sea-weed. Some, like the majority of the geckos, are nocturnal.

The motions of most lizards are executed with great but not enduring rapidity. With the exception of the chameleon, all drag their bodies over the ground, the limbs being wide apart, turned outward, and relatively to the bulk of the body generally weak. But the limbs show with regard to development great variation, and an uninterrupted transition from the most perfect condition of two pairs with five separate clawed toes to their total disappearance; yet even limbless lizards retain rudiments of the osseous framework below the skin. The motions of these limbless lizards are very similar to those of snakes, which they resemble in their elongate body passing into a long cylindrical and tapering tail.

In a great many lizards (*Lacertidæ*, skinks, geckos) the muscles of the several vertebral segments of the tail are so loosely connected, and the axis of the vertebrae is so weak, that the tail breaks off with the greatest facility. The part severed retains its muscular irritability for a short time, wriggling as if it were a living creature. A lizard thus mutilated does not seem to be much affected by its loss, and in a short time the part is reproduced; but, while the muscles and also the integuments may be perfectly regenerated, the osseous part always remains replaced by a cartilaginous rod, without vertebral segmentation. This faculty is of great advantage to the lizards endowed with it; they are either species in which the tail has no special function, such as to assist in a particular kind of locomotion or to serve as a weapon of defense, or they are small species which lack other means of escape from their numerous enemies. The geckos are even able to throw off their tail spontaneously, and are said to do this frequently when pursued by some other animal, which is satisfied with capturing the wriggling member, while the owner saves its life by a rapid flight.

The majority of lizards are carnivorous, the larger feeding on small mammals, birds, fishes, and eggs, the smaller on insects, worms, and other invertebrates. Not a few, however, are herbivorous, as the larger leguans, and many agamas. This difference in diet is quite independent of modifications of dentition.

All lizards are oviparous, the eggs being of an oval shape, and covered with a hard or leathery calcareous shell. The number of eggs laid is, in comparison with other reptiles, small, perhaps never exceeding forty, and some, like the anolis and geckos, deposit only one or two at a time, but probably the act of oviposition is repeated in these lizards at frequent intervals. The parents do not take care of their progeny, and leave the eggs to hatch where they were deposited. In a few lizards, however, the eggs are retained in the oviduct until the embryo is fully developed; these species, then, bring forth living young, and are called *ovoviviparous*.

No lizard is venomous, with, perhaps, a single exception (*Heloderma*).

Heloderma horridum is a Mexican lizard, which in its native country has the reputation of being a most poisonous reptile. Its anterior teeth are, indeed, provided with a deep groove, as in many poisonous snakes, and the submaxillary gland is enormously developed. Sumichrast has recently proved by actual experiment on mammals the fatal effects of the bite of this lizard; and J. Stein, a traveler in Mexico, who was bitten in the finger, suffered from symptoms similar to those resulting from the bite of a poisonous snake. It thus appears that the fear in which it is held by the natives is not due merely to its hideous appearance, as was for-

merly believed. Tubercles of a dirty brown and yellow color, with which its body is covered, give it the appearance of a leprous skin. It is about twenty inches long, and is known by the name of "Escorpion."

LLAMA, sometimes spelt *Lama*, a word by which the Peruvians designated one of a small group of closely allied animals, which, before the Spanish conquest of America, were the only domesticated hoofed mammals of the country, being kept, not only for their value as beasts of burden, but also for their flesh, hides, and wool—in fact, supplying in the domestic economy of the people the place of the horse, the ox, the goat, and the sheep of the Old World. The word is now sometimes restricted to one particular species or variety of the group, and sometimes used in a generic sense to cover the whole. Although they were often compared by early writers to sheep, and spoken of as such, their affinity to the camel was very soon perceived, and they were included in the genus *Camelus* in the *Systema Nature* of Linnæus. They were, however, separated by Cuvier in 1800 under the name of *Lama*, changed by Illiger in 1811 to *Auchenia*, a term afterward adopted by Cuvier, and almost universally accepted by systematic zoölogists, although there has been of late a disposition to revive the earlier name.

The animals of the genus *Auchenia* or *Lama* are, with the two species of true camels (to which the generic term *Camelus* is now restricted), the sole existing representatives of a very distinct section of the "artiodactyle" or even-toed ungulates, called *Tylopoda*, or "boss-footed," from the peculiar bosses or cushions placed on the under surface of their feet, and on which they tread. This section thus consists of a single family, the *Camelidæ*, the other sections of the same great division being the *Suina* or pigs, the *Tragulina* or chevrotains, and the *Pecora* or true ruminants, to each of which the *Tylopoda* have more or less affinity, standing in some respects in a central position between them, borrowing as it were some characters from each, but in others showing great special modifications not found in any of the other sections.

Until within the last few years the existence of two genera having so very much in common as the camels and the llamas, and yet so completely isolated geographically, had not received any satisfactory explanation, for the old idea that they in some way "represented" each other in the two hemispheres of the world was a mere fancy without philosophical basis. The discoveries made mostly within the past ten years of a vast and previously unsuspected extinct fauna of the American continent of the Tertiary period, as interpreted by the able palæontologists Leidy, Cope, and Marsh, has thrown a flood of light upon the early history of this family, and upon its relations to other mammals. It is now known that llamas at one time were not confined to the part of the continent south of the Isthmus of Panama, as at the present day, for their remains have been abundantly found in the Pleistocene deposits of the region of the Rocky Mountains, and in Central America, some attaining a much larger size than those now existing. There have also been found in the same regions many camel-like animals exhibiting different generic modifications, and, what is more interesting, a gradual series of changes, coinciding with the antiquity of the deposits in which they are found, have been traced from the thoroughly differentiated species of the modern epoch down through the Pliocene to the early Miocene beds, where, their characters having become by degrees more generalized, they have lost all that especially distinguishes them as *Camelidæ*, and are merged into forms common to the ancestral type of all the other sections of the Artiodactyles. Hitherto none of these annectant

forms have been found in any of the fossiliferous strata of the Old World; it may therefore be fairly surmised (according to the evidence at present before us) that America was the original home of the *Tylopoda*, and that the true camels have passed over into the Old World, probably by way of the north of Asia, where we have every reason to believe there was formerly a free communication between the continents, and then, gradually driven southward, perhaps by changes of climate, having become isolated, have undergone some further special modifications; while those members of the family that remained in their original birthplace have become, through causes not clearly understood, restricted solely to the southern or most distant part of the continent. There are few groups of mammals of which the palæontology history has been so satisfactorily demonstrated as the one of which we are treating.

In essential structural characters, as well as in general appearance and habits, all the animals of this genus very closely resemble each other, so that the question as to whether they should be considered as belonging to one, two, or more species has been one which has led to a large amount of controversy among naturalists. The question has been much complicated by the circumstance of the great majority of individuals which have come under observation being either in a completely or partially domesticated state, and descended from ancestors which from time immemorial have been in like condition, one which always tends to produce a certain amount of variation from the original type. It has, however, lost much of its importance since the doctrine of the distinct origin of species has been generally abandoned. The four forms commonly distinguished by the inhabitants of South America are recognized by some naturalists as distinct species, and have had specific designations attached to them, though usually with expressions of doubt, and with great difficulties in defining their distinctive characteristics. These are—(1) the llama, *Auchenia glama* (Linn.), or *Lama peruana* (Tiedemann); (2) the alpaca, *A. pacos* (Linn.); (3) the guanaco or huanaco, *A. huanacus* (Molina); and (4) the vicugna (Molina), *A. vicugna*, or *A. vicugna*, (Cuv.)

The guanaco has an extensive geographical range, from the high lands of the Andean region of Ecuador and Peru to the open plains of Patagonia, and even the wooded islands of Tierra del Fuego. It constitutes the principal food of the Patagonian Indians, and its skin is invaluable to them, as furnishing the material out of which their long robes are constructed. It is about the size of a European red deer, and is an elegant animal, being possessed of a long, slender, gracefully curved neck and fine legs.

The alpaca is believed by most naturalists to be a variety of the vicugna; others have, however, identified it with the guanaco, and some consider it as a distinct species. It is usually found in a domesticated or semi-domesticated state, being kept in large flocks which graze on the level heights of the Andes of southern Peru and northern Bolivia at an elevation of from 14,000 to 16,000 feet above the sea-level, throughout the year. It is not used as a beast of burden like the llama, but is valued only for its wool, of which the Indian blanket and ponchas are made. Its color is usually dark brown or black. The characteristics of its wool, and the history of its introduction into our manufacturing industry, are described in the article ALPACA.

LLANDAFF, a city of Glamorgan, South Wales. See CARDIFF, within which parliamentary borough it is almost entirely included.

LLANDUDNO, a watering-place in Carnarvonshire, North Wales, situated on the Irish Sea, and at the

mouth of the Conway, in a finely sheltered bay, fifty miles west of Chester by rail. Population (1901), about 7,000.

LLANELLY, a market-town, parliamentary borough, and seaport town of Carmarthenshire, South Wales, is situated on a creek of Carmarthen Bay, on the river Lougher, and on several railway lines, 11 miles west of Swansea, and 22½ west-northwest of London. Llanelly is included in the Carmarthen district of parliamentary boroughs. The population of the urban sanitary district is 24,000.

LLANGOLLEN, a picturesque market-town of Denbighshire, North Wales, and a favorite summer-resort, is beautifully situated in a fine vale surrounded by lofty mountains, on the right bank of the Dee, and on a branch line of the Great Western Railway, nine miles southwest of Wrexham, and twenty-two southwest of Chester. Population about 4,000.

LLORENTE, JUAN ANTONIO, the historian of the Spanish Inquisition, was born March 30, 1756, near Calahorra, Aragon, studied at Tarragona and Saragossa, received (by dispensation) priest's orders in 1779, and became vicar-general to the bishop of Calahorra in 1782. In 1785 he became commissary of the Holy Office at Logroño, and in 1789 its general secretary at Madrid. In 1805 he obtained a canonry at Toledo, and in 1806-8 his *Noticias Historicas sobre las tres Provincias Vascongadas* appeared. In the crisis of 1808 Llorente identified himself with the Bonapartists, and from 1809 onward he was engaged in superintending the execution of the decree of suppression of the monastic orders, and in examining the archives of the Inquisition for his *History*, a work which appeared in 1817-18 at Paris, where its author had been residing since the return of Ferdinand VII. to Madrid in 1814. Translated within a few years into German, English, Dutch, Italian, and Spanish, it attracted much attention throughout Europe, and involved its author in considerable persecution and hardship, which, on the publication of his *Portraits politiques des Papes* in 1822, culminated in a peremptory order (December, 1822) to quit France. His death, caused, or at least hastened, by the fatigues of the hasty journey to Spain, took place at Madrid on February 5, 1823.

LLOYD'S, an association of merchants, shipowners, underwriters, and ship and insurance brokers, having its headquarters in a suite of rooms in the northeast corner of the Royal Exchange, London. Originally a mere gathering of merchants for business or gossip in a coffee-house kept by one Edward Lloyd in Tower street, London, the earliest notice of which occurs in the *London Gazette* of February 18, 1688, this institution has gradually become one of the greatest and most perfect organizations in the world in connection with commerce. The establishment existed in Tower street up to 1692, in which year it was removed by the enterprising proprietor to Lombard street, in the very center of that portion of the old city of London most frequented by merchants of the highest class. Shortly after this event Mr. Lloyd gave another proof of his enterprise and intelligence by the establishment of a weekly newspaper, furnishing commercial and shipping news, in those days an undertaking of no small difficulty. This paper took the name of *Lloyd's News*, and, though its life was not a prolonged one, it was destined to be the precursor of the now ubiquitous *Lloyd's List*, the oldest existing paper, the *London Gazette* excepted, of the present day. In Lombard street the business transacted at Lloyd's coffee-house steadily grew in extent and importance, but it does not appear that throughout the greater part of the eighteenth century the merchants and underwriters frequenting the rooms were bound

together by any rules, or acted under any organization. By and by, however, the rapid increase of marine insurance business made a change of system and improved accommodation absolutely necessary, and, accordingly, after finding a temporary resting place in Pope's Head alley, the underwriters and brokers finally settled down in the Royal Exchange in March, 1774. One of the first improvements in the mode of effecting marine insurance springing out of this state of things was the introduction of a printed form of policy. Hitherto various forms had been in use; and, to avoid the numerous disputes consequent on a practice so loose and unsatisfactory, the committee of Lloyd's proposed a general form, which was finally adopted by the members on January 12, 1779, and which remains in use, with only a few slight alterations, to this day. The two most important events in the history of Lloyd's, during the present century, are the reorganization of the association in 1811, and the passage of an act in 1871 granting to Lloyd's all the rights and privileges of a corporation sanctioned by parliament. According to this Act of Incorporation, the three main objects for which the society exists are: First, the carrying out of the business of marine insurance; secondly, the protection of the interests of the members of the association; and, thirdly, the collection, publication, and diffusion of intelligence and information with respect to shipping. In the promotion of the last-named object, obviously the foundation upon which the entire superstructure rests, an intelligence department has been gradually developed, which, for wideness of range and efficient working, has no parallel among private enterprises in any country.

LOACH. The loaches (*Cobitidina*) are small fishes of the Carp family (*Cyprinidae*), with a generally cylindrical body, with very small or without any scales, with six or more barbels round the mouth, with a short dorsal and anal fin, and with the pharyngeal teeth in a single series.

LOANDA, or in full São Paulo de Loanda, is the capital of the Portuguese settlements in western Africa, and the principal municipality of the Loanda district, one of the three into which Angola is divided. The beautiful bay, protected from the surf by the long, narrow island of pure sand from which the town takes its name, is backed by a line of low, sandy cliff which at its southern end sweeps out with a sharp curve and terminates in the bold point crowned by Fort San Miguel. A good part of the town lies on the shore, but the more important buildings—the government offices, the governor's residence, the palace of the bishop of Angola, and the admirable hospital—are situated on the higher grounds. The population is from 10,000 to 12,000 (Lux gives 18,000 to 20,000), about a third being whites.

LOANGO, in the wider signification of the name, is a region on the west coast of southern Africa, which extends from the mouth of the Congo (Zaire) river northward through about two degrees, with no very definite limit in this direction, unless we adopt the Numbi river, which falls into Chilunga Bay, and was formerly considered the northern boundary of the Loango kingdom. In a narrower sense it is the country bounded on the south by the Luemma, and on the north by the Kuilu—the district between the Luemma and the Chiloango being known as Chiloango or Little Loango, that between the Chiloango and the Congo as Kakongo and Angoy, and that to the north of the Kuilu as Chilunga.

LOBELIA, L., the typical genus of the tribe *Lobelieae*, of the order *Campanulaceae*, named after Matthias de Lobel, a native of Lille, botanist and physician to James I. It numbers about 200 species, natives of nearly all the temperate and warmer regions of the world, excepting central and eastern Europe as

well as western Asia. The genus is distinguished from *Campanula* by the irregular corolla and completely united anthers, and by the excessive acidity of the milky juice. The species earliest described and figured appears to be *L. cardinalis*, L., under the name *Trachelium americanum sive cardinalis planta*, "the rich crimson cardinal's flower;" Parkinson says, "it groweth neere the river of Canada, where the French plantation in America is seated;" De Candolle records it from New England to Carolina. This species, as well as several others, is in cultivation as ornamental garden plants.

LOBO, IERONIMO, a Jesuit missionary, was born in Lisbon in 1593, and died in 1678.

LOBSTER. See CRUSTACEA and FISHERIES.

LOCK—not being a canal lock—means the fastening of a door, or box, or drawer, which requires a key, or else some secret contrivance or manipulation, to open it. It is generally fixed to the door, but it may also be loose, and then it is called a padlock, which is internally like other locks, but externally has a half link or *bow* turning on a hinge at one end, while the other, after being put through a chain or staple on the door, enters the lock and is fastened by the bolt therein. The bolt may be moved by the key, or may close by a spring, but requires a key to open it, as in the case of handcuffs, which are a pair of padlocks of this kind united by a short chain. A common door lock also comprises a spring latch which opens by a handle, and sometimes a small bolt held by friction either shut or open, which is moved by a smaller handle inside the room only; but neither of these is the lock proper, any more than a hook or a button, or a common living latch. Therefore, omitting them, a lock is as defined above.

The earliest lock of which the construction is known is the Egyptian, which was used 4,000 years ago.

Mr. Chubb, the well-known lock-maker, used to show a wooden Chinese lock very superior to the Egyptian, and, in fact, founded on exactly the same principle as the Bramah lock, which long enjoyed the reputation of being the most secure lock ever invented; for it has sliders or tumblers of different lengths, and cannot be opened unless they are all raised to the proper heights, and no higher.

LOCKE, JOHN. Some idea of the man and his surroundings is more needed for the interpretation of what Locke has written than in the case of most philosophers. His youth was spent amid the war of principles of which England was the scene in the middle of the seventeenth century. In later life he mixed much with the chief actors in the political drama that followed the Restoration. In his advanced years he was the intellectual representative of tendencies which at the Revolution settlement inaugurated the tranquil material progress and tolerant but more prosaic spirit of the eighteenth century in England. It is instructive to see how the foundations of belief and the constitution of knowledge are investigated by an English gentleman, who was no recluse mediæval monk or pedantic modern professor, but a man of the world, practically conversant with affairs, in tone calm and rational, and now justly regarded as the typical English philosopher.

Locke was born in the county of Somerset, on August 29, 1632, six years after the death of Bacon, and three months before the birth of Spinoza. In 1646 he entered Westminster School, then of course under Puritan control, and at the headquarters of the parliamentary movement. The six following years were mostly spent there. He does not seem to have liked Westminster, and its memories perhaps produced the bias against public schools which afterward almost disturbed his philosophic impartiality in his *Thoughts on Education*.

In 1652 Locke passed from Westminster to Oxford. He there found himself at Christ Church, in charge of John Owen, the newly appointed Puritan dean, and vice-chancellor of the university. Christ Church was more or less Locke's home for thirty years. For eight years after he entered Oxford was ruled by the Independents, who, through Owen and Goodwin, unlike the Presbyterians, were among the first in England to promulgate the principles of genuine religious liberty. Locke's hereditary sympathy with the Puritans was gradually lessened by what he saw of the intolerance of the Presbyterians and the fanaticism of the Independents.

Oxford had suffered as a seat of learning during the civil war. Under Owen the scholastic studies and disputations were maintained with a formality unsuited to Locke's free, inquisitive temper. The reaction against them which he expressed showed thus early a strong disposition to rebel against empty verbal reasonings. He was not, according to his own account of himself to Lady Masham, a very hard student at first. He sought the company of pleasant and witty men, with whom he likewise took great delight in corresponding by letter; and in conversation and in these correspondences he spent much of his time. He took his bachelor's degree in 1656, and that of master in 1658, the latter on the same day with Joseph Glanville, the author of *Sceptis Scientifica*. In December, 1660, he was made tutor of Christ Church, and lectured in Greek, rhetoric, and philosophy in the following year.

At Oxford Locke was within reach of distinctive intellectual influences, then of great strength, and particularly fitted to promote self-education in a strong character. The metaphysical works of Descartes had appeared a few years before he entered Christ Church, and the *Human Nature* and *Leviathan* of Hobbes during his undergraduate years. It does not seem that Locke read extensively, but he was soon drawn to Descartes. After the Restoration he lived amid the influences which were then drawing Oxford and England into experimental research. Experiments in physics became the fashion after 1660. The Royal Society was that year founded at Oxford. Wallis and Wilkins, and afterward Boyle and Wren, at Oxford, and Barrow and Newton at Cambridge, helped to make chemistry, meteorology, and mechanics take the place of verbal disputes. We find him, accordingly, at work in chemistry about 1663, and also in the meteorological observations which always interested him.

The restraints of professional life were not well suited to Locke. There is a surmise that he once contemplated taking orders in the Church of England. His religious disposition attracted him to theological studies. His revulsion from the severe dogmatism of Presbyterians and the unreasoning fanaticism of Independents favored that connection with liberal Anglican churchmen which he maintained in later life. Before 1666 he seems to have been practicing medicine in Oxford. But, though afterward known among his friends as "Doctor," he never graduated as a physician. His health was uncertain, for he suffered all his life from chronic consumption and asthma, and besides that an event soon occurred which withdrew him from medical practice. To the end, however, he was fond of the science, and also ready on occasion to give friendly advice.

Locke had early shown an inclination to politics as well as to theology and to medicine. In 1665 he diverged from medical study at Oxford to diplomacy, and was engaged for a few months in this sort of business, as secretary to Sir Walter Vane on his embassy to Cleves. It was soon after his return from Germany in the following year that the incident occurred which determined his career in the direction of politics. Lord

Ashley, afterward first earl of Shaftesbury, the most truly historical figure among the statesmen of Charles II.'s reign, had come to Oxford for health. There Locke was accidentally introduced to him. This meeting was the beginning of a lasting friendship, sustained by a common sympathy with liberty—civil, religious, and philosophical. In 1667 Locke removed from Christ Church to Exeter House, Lord Ashley's London residence, to become his private secretary, and in 1673 secretary of the Board of Trade. Although he retained his studentship at Christ Church, and occasionally visited Oxford, and also his patrimony at Beluton, lately inherited from his father, he found a home and shared fortune with the great statesman during the fifteen years which followed his removal to Exeter House.

The manuscripts of Locke which belonged to this Oxford period throw welcome light on the growth of his mind in early life. Among them is an essay on the "Roman Commonwealth," which expresses convictions as to religious liberty and the relations of religion to the state, which were only strengthened and deepened in the progress of his life.

The Shaftesbury connection helped to save Locke from those idols of the den to which professional life in every form is exposed. It brought him much in contact with public men, with the springs of political action, and with the details of office. The place he held as confidential adviser of the greatest statesman of his age is indeed the most remarkable feature in his middle life. Exeter House afforded every opportunity for society, and of this Locke, according to his disposition, availed himself. He became one of the intimates among others of the illustrious Sydenham. But though he joined the Royal Society he seldom went to its meetings, for his custom all his life was to encourage small reunions of intimate friends. One of these at Exeter House was the occasion of the enterprise which has made his name memorable in history; for it was there that "five or six friends" met one evening in his rooms, about 1671, and discussed "principles of morality and religion" which seemed remote from questions about "human understanding." They "found themselves quickly at a stand by the difficulties that arose on every side." Locke suggested a careful examination of the exact limits of man's power to know the universe as the proper way out of their difficulties. The results of the reflection to which these difficulties thus gave rise, he thought, when he set to work, might be contained on "one sheet of paper." But what was thus "begun by chance was continued by entreaty, written by incoherent parcels, and after long intervals of neglect resumed again as humor and occasions permitted," till, at last, at the end of nearly twenty years, it was given to the world as the *Essay on Human Understanding*. This work gave intellectual unity and a purpose to his life as a man of letters and philosophy.

The fall of Shaftesbury in 1675 enabled Locke to escape for four years from the center of English politics to a retreat in France, where he could unite the study of "human understanding" with attention to health. He spent three years partly at Montpellier and partly in Paris. His journals and commonplace books of this period show the *Essay* in process of construction. The visits to Paris were times of meeting with men of letters and science, among others Guenellon, the well-known Amsterdam physician; Römer, the Danish astronomer; Thoynard, the critic; Thevenot, the traveler; Justel, the jurist; and Bernier, the expositor of Gassendi. There is no mention of Malebranche, whose *Recherche de la Vérité* had appeared three years before, and who was then at the Oratoire, nor of Arnauld, his illustrious rival at the Sorbonne.

Locke returned to London in 1679. A reaction against the court party had for a time restored Shaftesbury to power. Locke resumed his old confidential relations. A period of much-interrupted leisure followed. It was a time of plots and counterplots, when England seemed on the brink of another civil war. In the end Shaftesbury was committed to the Tower, tried, and acquitted. More insurrectionary plots followed in the summer of 1682, after which, isolated at home, he escaped to Holland, and died at Amsterdam in January, 1683. In these two years Locke was much at Oxford or at Beluton. The last movements of Shaftesbury did not recommend themselves to the sage caution of his secretary.

In his fifty-second year, in the gloomy autumn of 1683, Locke retired to Holland in voluntary exile. It was then the asylum of eminent persons who were elsewhere denied civil and religious liberty. Descartes and Spinoza had meditated there; it had been the home of Erasmus and Grotius; it was now the refuge of Bayle. Holland was Locke's sanctuary for more than five years; but it was hardly a voluntary retreat. His (unpublished) letters thence represent him as a man of tender feelings, on whom exile sat heavily. Amsterdam was his first Dutch home. For a time he was in danger of arrest at the instance of the English Government. After anxious months of concealment in the houses of friends, he escaped; he was, however, deprived of his studentship at Christ Church, and Oxford was finally closed against him by the order of the king. But Holland introduced him to new friends. One of these, ever after an intimate correspondent, was Philip van Limborch, the successor of Episcopius as Remonstrant professor of theology, lucid, learned, and tolerant, the friend of Cudworth, Whichcote, and More. Limborch attached him to Le Clerc, then the youthful representative of letters and philosophy in Limborch's college, who had escaped from Geneva and Calvinism to the milder atmosphere of Holland. The *Bibliothèque Universelle* of Le Clerc, commenced in 1686, soon became the chief organ in Europe of men of letters. Locke was at once united with him in the work, and contributed several articles. It was his first appearance as an author, although he was now more than fifty-four years of age, and afterward produced so many volumes. This tardiness in authorship is a significant fact in Locke's mental history, in harmony with the tempered wisdom and massive common sense which reign throughout his works. The next fourteen years were those in which the world received the thoughts which observation of affairs and reflection had so long been forming in his mind. They were taking shape for publication while he was in Holland. The *Essay* was finished there, and a French epitome of it appeared in 1688, in Le Clerc's journal. Locke was then at Rotterdam, where he lived for more than a year in the house of a Quaker friend, Benjamin Furley, a wealthy merchant and collector of books. The course of affairs in England at last opened a way for his return to his native country. At Rotterdam he was the confidant of the political exiles, including Burnet and Mordaunt, afterward the famous earl of Peterborough, as well as of the prince of Orange. William landed in England in November, 1688; Locke followed in February, 1689, in the same ship with the princess of Orange and Lady Mordaunt.

It was after his return to England that through authorship Locke emerged into European fame. Within a month he had declined the embassy to Brandenburg, and taken instead the modest office of commissioner of appeals with its almost nominal duties. The two years 1689 and 1690, during which he lived at Dorset Court in London, were memorable for the publication of his two chief works in social polity, and also of the most popu-

lar and widely influential book in modern philosophy, which expresses in a generalized form the principles that lie at the root of all his political and other writings. The first of the three to appear was the defense of religious liberty in the state, in the *Epistola de Tolerantia*, addressed to Limborch. It was published at Gouda in the spring of 1689, and translated into English in autumn by William Popple, a Unitarian merchant in London. The *Two Treatises on Government*, in defense of the sovereignty of the people, followed a month or two after. The *Essay concerning Human Understanding* saw the light in the spring of 1690. He received £30 for the copyright, which was nearly the same as Kant afterward got for the first edition of his *Kritik der reinen Vernunft*. He had carried the manuscript from Holland ready for the press except a few last touches. It was the first book in which his name appeared, for the other two were published anonymously.

In 1696 Locke was induced to accept a commissionership on the Board of Trade, which made frequent visits to London needful in the four following years, and involved him considerably in the cares of office. Meantime the *Essay on Human Understanding* and the *Reasonableness of Christianity* were both becoming more involved in the wordy warfare between dogmatists and latitudinarians, trinitarians and unitarians, of which England was the scene in the last decade of the seventeenth century. The controversy with Edwards was followed by another with Stillingfleet, bishop of Worcester, which takes its place among the memorable philosophical controversies of the modern world. It arose in this way:—John Toland, an Irishman, in his *Christianity not Mysterious*, had exaggerated some passages in the *Essay*, and then adopted the opinions as his own. In the autumn of 1696, Stillingfleet, who was a learned and argumentative ecclesiastic more than a religious philosopher, in a *Vindication of the Doctrine of the Trinity* wrote some pages on Locke, condemning him especially for eliminating mystery from human knowledge in his account of what is meant by "substance." Locke replied in a *Letter* dated January, 1697. Stillingfleet's rejoinder appeared in May, followed by a *Second Letter* from Locke in August, to which the bishop replied in the following year. Locke's elaborate *Third Letter*, in which the ramifications of the controversy are pursued with a tedious expenditure of acute reasoning and polished irony, was delayed till 1699. The death of Stillingfleet in that year brought this famous trial of strength to an end. (The interesting episode of Molyneux's visit to Oates, followed by his death a few days after his return to Dublin, occurred in 1698, when the Stillingfleet controversy was at its height.) Other critics were now entering the lists against the *Essay*. One of the ablest was John Sergeant, a Catholic priest, in his *Solid Philosophy Asserted Against the Fancies of the Idealists*, in 1697. He was followed by Thomas Burnet and Dean Sherlock. Henry Lee, rector of Tichmarsh, produced in 1702 a folio volume of notes on each chapter in the *Essay*, under the title of *Anti-Scepticism*; John Broughton dealt another blow in his *Psychologia* in the following year. About the same time, too, John Norris returned to the attack, in various passages in his *Theory of the Ideal or Intelligible World*. Locke was defended with vigor by Samuel Bolde, a Dorsetshire clergyman. The *Essay* was all the while spreading over Europe, impelled by the great name of its author as the chief friend and philosophical defender of civil and religious liberty.

After 1700 Locke was gathering himself up for the end, in the rural repose of family life at Oates. The commission at the Board of Trade was resigned, and the visits to London ceased. Scriptural studies and religious

meditation engaged most of his available strength in the four years that remained. The Gospels had been much searched by him when he worked in theology years before. He now turned to the Epistles of St. Paul, and applied the spirit of the *Essay*, and the rules of critical interpretation which apply to other books, to interpret a literature which he still venerated with the submissiveness of the pious Puritans who surrounded his youth. The results of these studies were ready for the printer when he died, and were published about two years afterward. A few pages on *Miracles*, written in 1702, in connection with Fleetwood's essay, also appeared posthumously. More adverse criticism was now reported to him, and the *Essay* was formally condemned by the authorities at Oxford. All that summer of 1704 he continued to decline, tenderly nursed by Lady Masham and her step-daughter. On October 28th he passed away, as he declared, "in perfect charity with all men, and in sincere communion with the whole church of Christ, by whatever names Christ's followers call themselves."

LOCKHART, JOHN GIBSON was born in 1794 in Lanarkshire, where his father, Doctor Lockhart, was minister. His mother was daughter of the Rev. John Gibson, minister of St. Cuthbert's, Edinburgh. In 1796 his father was transferred to Glasgow, where John Lockhart was reared and educated. He derived his rare abilities from his mother, and his first regular teaching from the High School of Glasgow.

Lockhart was not turned fourteen when he was entered at Balliol College, but he soon asserted his character and his powers. His fun and satire made him at once popular and formidable, while beyond the regular studies of the place he acquired a great store of extra knowledge. He read French, Italian, German, and Spanish, was curious in classical and British antiquities, and well versed in heraldic and genealogical lore. Lockhart went up to the schools in the Easter term of 1813—not nineteen years of age—and, notwithstanding the most audacious employment of part of his time in caricaturing the examiners, he came out first in classics. The name of Henry Hart Milman, a subsequent friend through life, stood next his. For mathematics he never had the least inclination.

He now quitted Oxford, and, before settling to the study of Scottish law, for which his father had designed him, he indulged a long-cherished wish to visit Germany. His knowledge of German had introduced him to the great band of poets and scholars who had suddenly exalted the fame of German literature. Lockhart had no means to undertake the journey; but here his reputation came to his aid. A proposal to translate Frederick Schlegel's *Lectures on the Study of History* was accepted by Mr. Blackwood, and the price of the labor paid before a line was written. Lockhart always spoke of this as a most generous act on "Ebony's" part, and his friendship with the liberal publisher lasted through life. He meanwhile paid his visit to Germany, was introduced to Goethe at Weimar, traversed France and the Netherlands, made careful observations on pictures and architecture, and returned to Edinburgh to study law by the time he was twenty-one. In 1816 he was called to the bar. But he had no friends among writers and attorneys; his brilliant powers of conversation did not comprise that of public speaking, and few, if any, briefs came in. His habits of observation, however, turned the time to a use afterward exemplified in *Peter's Letters*.

Edinburgh was then the stronghold of the Whig party. The *Edinburgh Review* was their organ, and it was not till 1817 that the Scotch Tories found a national channel of assertion and defense—namely, in *Blackwood's Magazine*. This periodical held its way dully

enough with its first numbers, when suddenly an outburst of wit and ridicule directed against the hitherto unchallenged writers of the Whig party, surpassing them in cleverness and equaling them in personalities, electrified the Edinburgh world. Wilson (Christopher North), Hogg (the Ettrick Shepherd), and Lockhart had joined the staff, and retaliation for long pent-up wrongs began. Lockhart's pen contributed scholarly papers on various subjects, including hearty criticism and eulogium on Coleridge, Wordsworth, and other victims of a *Review* which could find only scant praise even for Walter Scott. His translations also of the Spanish ballads appeared for the greater part in *Blackwood*. But his pen was more often dipped in caustic, dealing out attacks and recriminations which led to regrettable consequences. Meanwhile the gifted and handsome young man, for Lockhart's head was cast in the highest type of brilliant manly beauty, had attracted the notice of Walter Scott. They met first in 1818. The acquaintance soon ripened into friendship, and that friendship led to the union between Lockhart and Scott's eldest daughter, Sophia, in April, 1820. Between 1818, when he joined the *Blackwood* staff, and 1825 Lockhart's pen was indefatigably at work. As early as 1819 *Peter's Letters* to his Kinsfolk appeared.

Valerius, a Roman Story, followed next (1821). As *Valerius* was intended to illustrate the manners and customs of Rome in the time of Trajan, so *Reginald Dalton*, published in 1823, aimed at exhibiting the life of an undergraduate at Oxford as he had known it. *Adam Blair* (1822) is a tale of temptation, fall, and repentance, each fearful in its way, told with tremendous power, and as far removed from all that is morbid and false in sentiment as the author was himself.

In 1826, on the death of Mr. Gifford, the editorship of the *Quarterly Review* was offered to Lockhart, and accepted.

The conduct of a great periodical like the *Quarterly Review* is the touchstone of a man's capacity, knowledge, and temper. Looking back to an editorship which lasted twenty-eight years, it must be admitted that Lockhart maintained a high position in all these respects. He contributed largely to the *Review* himself, his biographical articles being especially admirable. He also found time, being a very glutton in work, for many a paper in *Blackwood*: he wrote what remains the most charming of the biographies of Burns; and he undertook the superintendence of the series called *Murray's Family Library*, which he opened in 1829 with a *Life of Napoleon*. But his chief work was the *Life of Walter Scott*, a task at once of love and duty. Lockhart knew the great and good man as no one else did, and felt that, whatever the mistakes in judgment, no life from first to last could better afford complete revelation.

Lockhart's life in London was a long succession of constant work, of dignified social success, and of heavy bereavements. His eldest boy, the suffering "Hugh Littlejohn" of the *Tales of a Grandfather*, died in 1831. Sir Walter Scott died in 1832; Anne Scott, the second daughter, who had come to live with the Lockharts in London, in 1833; Mrs. Lockhart in 1837. The love for his children was for long the one bright element in his life. But the death in 1852, and, sadder still, the previous life, of his surviving son Walter, a fine youth, who had entered the army under unfortunate auspices, broke down all that remained of health and spirit in the father.

Failing health compelled Lockhart to resign the editorship of the *Quarterly Review* in 1853. He spent the next winter in Rome, but returned to England with no restoration of vital power. He was conveyed to Abbotsford, where, under the tender care of

his daughter, Mrs. Hope Scott, and cheered by the prattle of his granddaughter, now the possessor of Abbotsford, he lingered till his death, November 25, 1854. He was buried in Dryburgh Abbey, at the feet of Walter Scott.

LOCK HAVEN, the capital of Clinton county, Penn., is situated on the Susquehanna river, twenty-five miles from Williamsport. It occupies a magnificent site in a valley surrounded by three mountain ridges. The city is an important manufacturing center, and has many tanneries, lumber-mills, breweries, iron-foundries and machine-shops. It has good railway facilities, three newspaper offices, two banks, and several hotels. Population (1890), 7,358; (1900), 7,210.

LOCKPORT, capital of Niagara county, N. Y., about twenty-one miles east of Niagara Falls, at the point where the New York Central Railroad crosses the Erie canal. It takes its name from the locks (ten in number) by which the canal is lowered sixty-six feet from the level of Lake Erie to that of the Genesee river; and its prosperity as a manufacturing center is due to the water-power. The surrounding country is a rich agricultural district, and in the vicinity are extensive limestone and sandstone quarries. Flour-mills are prominent among the industrial establishments; there are also numerous saw-mills, cotton and woolen factories, foundries, etc. Lockport was made a city in 1865. The population in 1890 was 16,038; in 1900, 16,581.

LOCLE, LE, a large village of Switzerland, in the canton of Neuchâtel, ten miles west-northwest from Neuchâtel. Along with La Chaux de Fonds, five miles northeast, it is the seat of the most extensive watch-making industry in the world; and it also carries on the domestic manufacture of lace. The valley in which Le Locle is situated used to be subject to inundation, but in 1802-6 a tunnel was constructed by which the surplus waters of the Bied discharge into the Doubs. About a mile to the west of the town the stream plunges into a deep chasm, and on the almost vertical face of the rock are what are usually called the subterranean mills of Cul des Roches, situated one above the other, to turn the water-power to account. The population of the commune is 10,464.

LOCRI, a people of Greece who are found in two different districts, on the Ægean coast opposite Eubœa and on the Corinthian Gulf between Phocis and Ætolia. The former are divided into northern Locri Epicnemidii, so called from Mount Cnemis, and the southern Locri Opuntii, whose chief town was Opus; but the name Opuntii is applied to the whole district by Thucydides, Herodotus, etc. Homer knows no distinction of tribes among the Locri. They were considered by Aristotle to be a Lelegian tribe; but they became Hellenized at an early time, and rank in Homer along with the other Greek tribes before Troy. Their national hero is Ajax Oileus, who often appears on coins. The Locri Ozolæ on the Corinthian Gulf were a rude and barbarous race who make no appearance in Greek history till the Peloponnesian War.

LOCUS, a geometrical term, the invention of the notion of which is attributed to Plato. It occurs in such statements as these:—The locus of the points which are at the same distance from a fixed point, or of a point which moves so as to be always at the same distance from a fixed point, is a circle; conversely a circle is the locus of the points at the same distance from a fixed point, or of a point moving so as to be always at the same distance from a fixed point; and so in general a curve of any given kind is the locus of the points which satisfy, or of a point moving so as always to satisfy, a given condition. The theory of loci is thus identical with that of curves.

LOCUST. In its general acceptation this term is strictly applicable only to certain insects of the order *Orthoptera*, family *Acrydiidae* (see *INSECTS*); and it is advisable to reiterate that, according to modern classification, the family *Locustidae* is now viewed in a sense that does not admit of what are popularly termed "locusts" being included therein. We universally associate with the term the idea of a very destructive insect; therefore many orthopterous species that cannot be considered true locusts have had the term applied to them; in North America it has even embraced certain *Hemiptera-Homoptera*, belonging to the *Cicadidae*, and in some parts of England cockchafers are so designated. In a more narrow definition of the term we are wont to associate with the destructive propensities the attribute of migration, and it therefore becomes necessary that a true locust should be a migratory species of the family *Acrydiidae*. Moreover, the term has yet a slightly different signification as viewed from the Old or New World. In Europe by a locust is meant an insect of large size, the smaller allied species being ordinarily known as "grasshoppers," hence the notorious "Rocky Mountain locust" of North America is to Eastern ideas rather a grasshopper than a locust.

Calopenus spretus is the "Rocky Mountain locust" or "grasshopper" of the North American continent. Though a comparatively small insect, not so large as some of the grasshoppers of English fields, its destructiveness has procured for it a notoriety scarcely excelled by that of any other. It is only recently that the persistent migration of American settlers westward extended into the home of this creature. Travelers and prospectors in these regions had previously spoken of enormous swarms of a destructive grasshopper as existing there, and no doubt these occasionally extended into regions already civilized, but the species was not recognized as distinct from some of its non-migratory congeners to which it is so closely allied as to require a practiced entomological eye to separate it therefrom. As time drew on, the various State entomologists made it their special duty to report on the insect, and at length, in 1877, the matter had become so serious that Congress appointed a United States Entomological Commission to investigate the subject, and report upon the best (if any) means of counteracting the evil effects of the pest. The result, so far as published, consists of two enormous volumes, teeming with information, and taking up the whole subject of locusts in both America and the Old World. *C. spretus* has its home or permanent area in the arid plains of the central region east of the Rocky Mountains, extending slightly into the southern portion of British North America; outside this is a wide fringe to which the term sub-permanent is applied, and this is again bounded by the limits of only occasional distribution, the whole occupying a large portion of the North American continent; but it is not known to have crossed the Rocky mountains westward, or to have extended into the eastern States.

As to remedial or preventive measures tending to check the ravages of locusts, little, unfortunately, can be said, but anything that will apply to one species may be used with practically all. One point is certain; direct remedies must always be of small avail. Something can be done (as is now done in Cyprus) by offering a price for all the egg-tubes collected, which is certainly the most direct manner of attacking them. Some little can be done by destroying the young larvæ while yet in an unwinged condition, and by digging trenches in the line of march into which they can fall and be drowned or otherwise put an end to. Infinitesimally little can be done with the winged hordes having the migratory instinct upon them; starvation, the outcome of their

own work, probably here does much. It has been shown that with all migratory locusts the breeding places, or true homes, are comparatively barren districts (mostly elevated plateaus); hence the progress of civilization and colonization, with its concomitant necessity for converting those heretofore barren plains into areas of fertility, may (and probably will) gradually lessen the evil.

Locusts, like all other animals, have their natural enemies. Many birds greedily devour them, and it has many times been remarked that migratory swarms of the insects were closely followed by myriads of birds. Predatory insects of other orders also attack them, especially when they are in the unwinged condition. Moreover, like all other insects, they have still more deadly insect foes as parasites. Some attack the fully developed winged insect. But the greater part adopt the more insidious method of attacking the eggs. To such belong certain beetles, chiefly of the family *Cantharidae*, and especially certain two-winged flies of the family *Bombyliidae*. These latter, in both the Old and the New World, must prevent vast quantities of eggs from producing larvæ. Popular ignorance on this subject is yet great, and within a few months before this article was written it was exemplified in a remarkable manner by a suggestion from the government officials of Cyprus, that a certain parasite known to be destructive to the eggs in Asia Minor might be introduced into the island, a suggestion immediately followed by the discovery that what is probably the same parasite already existed there.

A flight of locusts would appear not to be always an unmixt evil, even to man. The larger Old World species form articles of food, with certain semi-civilized and savage races, by whom they are considered as delicacies, or as part of ordinary diet, according to the race and the method of preparation.

LOCUST-TREE, *Ceratonia Siliqua*, L., the carob-tree, of the tribe *Cassieæ* of the order *Leguminosæ*, is the sole species, widely diffused spontaneously and by cultivation from Spain to the eastern Mediterranean regions, and from Egypt to Bornou in Central Africa, and imported to Hindustan. It differs from all leguminous plants by the dilated disk to the calyx. It has no petals, and the flowers are polygamous or dioecious. The legume is compressed, often curved, indehiscent, and coriaceous, but with sweet pulpy divisions between the seeds, which, as in other genera of the *Cassieæ*, are albuminous. The pods are eaten by men and animals, and in Sicily a spirit and a syrup are made from them. These husks being often used for swine are called swine's bread, and are probably referred to in the parable of the Prodigal Son.

LODÈVE, capital of an arrondissement of the department of Hérault, France, lies in a small valley where the Soulondré joins the Lergue, a tributary of the Hérault, thirty-four miles east-northeast from Montpellier. The population is 11,000.

LODGE, THOMAS, dramatist, novelist, pamphleteer, poet, was born about the year 1556 at West Ham, and was possibly the son of a namesake, shortly afterward lord mayor of London. He died of the plague in 1625.

LODI, a city of Italy, in the province of Milan, lies on the right bank of the Adda. The population of the city in 1900 was 20,537. On May 10, 1796, was fought the battle of Lodi between the Austrians and Napoleon, which made the latter master of Lombardy.

LODZ, a town of Russian Poland, in the province of Piotrkow, lies forty miles by rail to the north of the chief town of the province, on a branch railway of the line between Warsaw and Vienna. Population (1898), 315,209.

LOFOTEN AND VESTERAALEN, a "fogderi"

or bailiwick in the "amt" of Nordland, Norway, consists of a large and picturesque group of islands lying northeast and southwest off the northwest coast of Norway.

LOG. The ordinary log for ascertaining the speed of a ship consists of four parts, viz., the log-glass, log-line, log-reel, and log-ship. The word log may have been derived from the fact that a piece of wood was thrown overboard, to lie as a log in a fixed position, motionless; now the same name is applied to many contrivances and ingenious inventions for indicating directly, or for registering, the ship's progress through the water.

Though such information now appears to be so essential, nay, imperatively necessary to the safe conduct of a ship, it is a fact that no such simple means as the log and line was devised before the seventeenth century, or the subject even thought of theoretically before 1570.

In 1578 William Bourne published *Inventions and Devices*. There are 113 subjects treated of, many of them highly interesting, as they contain the crude germ of useful inventions. The twenty-first device is a close approach to Massey's self-registering log, which was found so useful 260 years later.

At the present day the principle upon which this log is arranged is easily understood. The mean degree of the meridian is assumed to be 69.09 statute miles, which gives 6,080 feet to the mean nautical mile—an estimate sufficiently accurate for navigating upon any part of the sphere. The distances upon the log-line being marked by pieces of line placed between the strands and carrying the requisite number of knots, this has given the name of knot to the nautical mile. The line is marked to knots and half knots (a single knot) only; the intermediate fractions are estimated. Two measurements are now in common use; that in the British navy is forty-seven feet three inches of line for each knot made per hour, which corresponds with a twenty-eight second glass—thus $(28 \times 6,080) \div 3,600 = 47.288$ feet; in the merchant service a knot is fifty feet seven inches, which is the correct proportion to a mile with the half minute glass. When a ship is going more than five or six knots, a short glass is used, fourteen or fifteen seconds, then the indications by the line are doubled. The shorter measure was probably chosen in consequence of the custom in vogue till about 1833 of marking the run on the log-board, or book, in knots and fathoms (or sea furlongs); the fractions are now invariably entered as tenths. The whole length of line is sixty to eighty fathoms, according to the speed anticipated; ten to twenty fathoms of which is allowed as stray line, that the log-ship may be in a fair position, before the rag of bunting called the turn-mark passes the hand. The line should be stretched and well wet before it is measured, and should be remeasured every day at sea. The inner end of the line is made fast to a light reel upon which it is wound.

The "log-ship" is a piece of wood about one-half inch thick and the fourth part of a circle, having a radius of five or six inches, weighted with lead round the curve in order to keep it upright in the water, but not to sink it. Two holes are bored, about one and one-half inches from the lower angles; through one a short piece of line is passed and knotted; the other end of the line has a bone or hard peg spliced to it, which is inserted in the other hole, thus forming a span by which it is attached to the log-line, and hangs square.

When the log is used, a man holds the reel over his head, the officer places the peg in the log-ship, and throws it well clear of the wake, then allows it to run the "stray line" off without assistance, steadying it just before the turn-mark comes to hand; as the mark

passes he calls to his assistant with the glass to "turn." As the sand runs pay out freely till the word "stop" is expected, then bring the line into a state of tension similar to what it was in when the turn-mark passed. At the word "stop" nip the line instantly, count the nearest knots, and estimate the tenths. When the line is stopped the strain should cause the peg to draw from the log-ship, and it can easily be hauled in. In ships of war it is hove every hour. The value of the operation depends, of course, entirely upon the care bestowed.

In large rivers, such as Rio de la Plata, where a strong current runs, and shoals are found out of the sight of land, a lead of four or five pounds weight is used instead of the log-ship; the lead rests on the bottom, the line and sand-glass being used in a manner similar to that above described. This is called the ground-log, and indicates the speed at which the ship is passing over the ground, irrespective of currents or tides; it will show also the lateral effect of current as it is hauled; this is the only log which can do so.

The sand-glasses are very primitive contrivances for measuring the requisite number of seconds; they are much affected by damp and change of temperature, and no reliance can be placed on their accuracy.

LOGAN, JOHN, a Scottish poet of some reputation, was born in 1748, and was son of George Logan, a farmer at Soutra, in East Lothian. He died in 1788.

LOGANSFORT, capital of Cass county, Ind., is situated at the confluence of the Wabash and the Eel rivers, and on the Wabash and Erie canal, seventy-five miles northwest of Indianapolis. It is an important railway junction, and the trading-center of an extensive agricultural district—dealing in grain, pork, and timber (poplar and black walnut). The Pittsburgh, Cincinnati, and St. Louis railroad maintains at this point large car-shops, occupying twenty-five acres, and employing 600 men. The population is 16,204 (1900 census).

LOGARITHMS. Logarithms were originally invented for the sake of abbreviating arithmetical calculations, as by their means the operations of multiplication and division may be replaced by those of addition and subtraction, and the operations of raising to powers and extraction of roots by those of multiplication and division. For the purpose of thus simplifying the operations of arithmetic, the base is taken equal to ten, and use is made of tables of logarithms in which the values of x , the logarithm, corresponding to values of m , the number, are tabulated. The logarithm is also a function of frequent occurrence in analysis, being regarded as a known and recognized function like $\sin x$ or $\tan x$; but in mathematical investigations the base generally employed is not ten, but a certain quantity usually denoted by the letter e , of value 2.71828 18284

Thus in arithmetical calculations if the base is not expressed it is understood to be ten, so that $\log m$ denotes $\log_{10} m$; but in analytical formulæ it is understood to be e .

The invention of logarithms has been accorded to John Napier, baron of Merchiston, in Scotland, with a unanimity which is rare with regard to important scientific discoveries. The first announcement was made in Napier's *Mirifici logarithmorum canonis descriptio* (Edinburgh, 1614), which contains an account of the nature of logarithms, and a table giving natural sines and their logarithms for every minute of the quadrant to seven or eight figures.

For a description of existing logarithmic tables, and the purposes for which they were constructed, the reader is referred to the article TABLES (MATHEMATICAL).

LOGIC, in the most general acceptance of the term, may be regarded as the systematic study of thought. So wide a definition is certainly sufficient to comprehend all that may have been at various times included within the scope of logical doctrine, but in other respects it is of small value. It does not serve to mark off logic from philosophy as a whole, which is unquestionably the systematic exposition of thought, nor from psychology, which includes within its wider range what may well be described as the study of thought. Without some more accurate discrimination of the province and method of logic, neither the extent of matter to be included within the study nor the peculiarity of the method by which such matter is treated can be determined. The distinction of logic from the sciences, as dealing in the abstract with that which is concretely exemplified in each of them, is certainly a first step in the process of determination about which there can be little or no doubt. But if the distinction remain vague, it is not sufficient to differentiate logic from many other disciplines, philosophical or philological, and if it be made more precise, the new characteristics will be found to involve some special view as to what constitutes the common feature in the sciences, and to vary with the possible varieties of view. As a rule, too, the added characteristics do not serve by themselves to mark off logical treatment as an independent kind of investigation. They are most frequently obtained by a general survey of scientific procedure. Thus it may be said that in all sciences there are implied clearly defined notions, general statements or judgments, and methodical proofs; logic therefore, as the theory of the general element in science, will appear as the treatment of notions, judgments, and proofs generally, or in the abstract. If so, then, unless some implied principle further determine the course of procedure, logic would be regarded as a merely descriptive account of the parts making up scientific knowledge, and it would be not only impossible to assign to it an independent position, but hard to discriminate it from psychology, which likewise deals with the parts of knowledge. If it be understood, however, or explicitly stated, that in all scientific knowledge there is community of method, resting on common principles or laws of knowledge as such, then clearly not only the province of logic, as now made identical with the treatment of the essence of knowledge, but the special nature of the theorems making up the body of logic, must depend upon the general conception of knowledge with which the thinker starts. In the view of logic taken, e.g., by Mill, the fundamental idea is that of *evidence*, under which must be included all the grounds for any judgment not resting on immediate perception. So far as verbal statement is concerned, the adoption of this as the root idea would not distinguish in any special way the treatment of logical problems resting on it, but in fact each problem is dealt with in accordance with the particular theory of what, from the nature of human knowledge, constitutes evidence. Logic thus involves, or in truth becomes, a theory of knowledge, and in the end, for general spirit and details of doctrine, refers to an ultimate philosophic view. There seems no escape from this conclusion. Start as we may, with popular, current distinctions, no sooner do logical problems present themselves than it becomes apparent that, for adequate treatment of them, reference to the principles of ultimate philosophy is requisite, and logic, as the systematic handling of such problems, ceases to be an independent discipline, and becomes a subordinate special branch of general philosophy.

The attempt to avoid this conclusion must of necessity take form in some discrimination of logic from other varieties which may with it be classed under philosophy

in general, and such discrimination is usually effected by laying stress on one or other of the following characteristics.

In the whole process of knowledge, it may be said, we are able to distinguish and to regard in isolation the methods according to which, from a combination of various elements, cognition of things grows up, and the laws according to which these elements must be ordered, if our subjective consciousness is to represent accurately and faithfully the relations of things. The laws of knowledge, there being understood by knowledge the whole sum of mental determinations in and through which the world of external and internal experience is realized for us, are of two distinct kinds, natural and normal. For the treatment of the natural laws the most appropriate title is psychology; for that of the normal or regulative laws the title logic is peculiarly appropriate. By the one science knowledge is regarded in its relation to the subjective consciousness, as so much of what enters into and constitutes the world of inner experience; by the other knowledge is regarded in its relation to truth, to the objective system, as the means whereby, for theoretical or practical purposes, an orderly and verifiable conception of this system is realized. A definite place seems thus secured for logic, but, if one may judge merely from the various attempts to expound the body of logical doctrines from this point of view, the characteristic feature is not yet sufficient to determine the boundaries of the science or the specific nature of its problems. In fact, the feature selected might be accepted as the distinguishing mark of logical science by writers who would include under that common title the most diverse matters, and who would differ fundamentally in respect to the treatment of isolated problems. The metaphysical logic of Hegel, the empirical logic of Mill, the formal logic of Kant, might all claim to be developments of this one view of the essence of logic. So wide a divergence is clear evidence that the criterion selected, though possibly accurate, is not sufficiently specific, and that the interpretation of it, which in truth determines for each the nature and boundaries of the science, depends upon the view taken respecting knowledge as a whole in its relation to the objective order of experience, respecting the import of the so-called normal laws, and respecting the subjective elements supposed to constitute knowledge.

On all sides this particular definition of logic is beset with difficulties, which it cannot afford to dismiss by means of the simple demand that knowledge shall be accepted as somehow given. For, apart altogether from the danger that under so wide a term as knowledge many differences may be accommodated, it then becomes impossible to do more than treat in a quasi-empirical fashion mental facts, the nature and peculiarities of which are to be learned from some external source. In the latter, more detailed examination of the view of logic here briefly described, it will be pointed out that the usual formula by which the several logical notions are introduced, viz., that their nature as mental facts is dealt with in psychology, from which logic borrows, is in fact much more than a formula. The logical peculiarities will be found to rest mainly upon the psychological characteristics as borrowed, while it is evident that no substantive, independent existence can be vindicated for a doctrine, the succession of whose parts, and their essential nature, are given externally.

Some of the perplexities that arise when logic is treated as the theory of the normal laws of knowledge may be obviated by the current distinction between immediate and mediate knowledge. The normal laws of knowledge might be said to apply solely to the process of mediate cognition, and their final aim would be

defined as harmony between mediate knowledge and immediate experience. But it is difficult to distinguish with perfect accuracy between the two kinds of knowledge in question; it is impossible that the treatment of the logical problem should not depend entirely on the view taken as to the nature of that which differentiates mediate from immediate knowledge. Whether we express this as thought or as belief, its nature then becomes the all-important factor in determining the course of logical treatment, and further progress will manifest divergencies according as stress is laid on the subjective characteristics of thought, the laws to which, from its essential nature, all its products must conform, or on the limitations imposed by principles which have reference to the most general relations of the things thought about. In the one case a formal logic, of the type commonly known as the Kantian, would be developed, in the other either an empirical logic, like that of Mill, wherein the nature of notions, propositions, and reasonings is considered from the point of view of the empirical conception of experience, or a transcendental logic, like that involved in the *Critique of Pure Reason*, or a metaphysical logic, like that of Hegel, or a mixed doctrine, like that of Trendelenburg, Lotze, and Ueberweg. In short, the general philosophic view of thought is that upon which the character of logic as a science rests.

There has above appeared, incidentally, one of the most current methods of solving the logical problem, by procedure from the distinction between that which is given to the mind in knowledge and that which is supplied by the mind itself. No distinction seems more simple; none is in reality more complex. The opposition on which, in its popular acceptance, it rests is that between the individual, concrete, thinking subject, and the world of objective facts, existing, as it were, to be cognized. The full significance of such an opposition, the forms in which it presents itself in conscious experience, the qualifications which must be introduced into the statement of it that it may have even a semblance of reality—these are problems not solved by a simple reference to the distinction as existing. It may well be held that knowledge is, for the individual, the mode (or one of the modes) in which his relation to the universe of fact is subjectively seized, but it is not therefore rendered possible to effect an accurate and mechanical separation of knowledge into its matter and form. Even on lower grounds it may be held that by the employment of this criterion little or no light is thrown upon the logical question. For no determination is supplied by it of the universal characteristic of form as opposed to matter in knowledge, and a comparison of various expositions will show the most startling diversity of view respecting the nature and boundaries of the formal element in knowledge. It is, of course, true that in one sense any scientific treatment of knowledge is formal. Our analysis extends only to the general or abstract aspect of cognition, not to its actual details. But we are not, on that account, dealing with the form of knowledge. So soon as it is attempted to define more accurately what shall be understood by form, then it is found that various views of logic arise, corresponding to the variety of principles supposed to be applied in the treatment of form. Thus the stricter followers of the Kantian logical idea, e.g., Mansel and Spalding, recognize, as sole principles which can be said to be involved universally in the action of thought, the laws of identity, non-contradiction, and excluded middle, and in their hands logic becomes merely the systematic statement of these laws, and the exposition of the conditions which they impose upon notions, judgments, and reasonings. Analytical consistency, i.e., absence of

contradiction, is on this view the one aspect of knowledge which is susceptible of logical treatment. On the other hand, the idea of a contribution furnished by the mind itself to knowledge may lead to a more concrete and yet not less exact system of the forms of knowledge, if there be taken into account the real character of the operation by which such contribution is made. Thus, in the logic of Ulrici, from the view of thought as essentially the distinguishing faculty, by which definiteness is given to the elements entering into knowledge, there follows not simply an iteration of the principle that thought must not contradict itself, but a systematic evolution of the fundamental relations involved in the action of thought, in which the more specifically logical products, the notion, judgment, and reasoning, have a determinate place assigned to them.

Not only, then, may quite distinct provinces be assigned to logic by thinkers who start with the same idea of thought as contributing to knowledge, but, as may well be imagined, the treatment of special logical problems presents a most bewildering variety. The nature of judgment, the principle of reasoning, the characteristics of thought which is in accordance with logical rule, will be viewed differently according to the special interpretation put upon the functions of the subjective factor in knowledge. Here again we find that the really influential fact in the determination of the province and method of logical science is a general philosophic conception of knowledge or thought.

There remains yet one method by which a clear and sufficient definition of the province and function of logic may be attainable. It may be that the separation of logic from other philosophic disciplines has come about historically, and that the assignment to logic of a special body of problems and a special kind of treatment is due to the accidents of its development. We might therefore hope to gain from a comparative survey of the field of logic, as that has been historically marked out, some definite view not only respecting the specific problems of logical theory, but also regarding the grounds for the isolated treatment of them. That in the history of logic there should be found a certain continuity of doctrine and development may, however, be compatible with entire absence of a common body of received logical matter, and the result of an historical research may be little more than a statement of distinct conceptions regarding the nature and province of the science, leading to the inclusion of very distinct materials within its scope. It requires but a superficial investigation of that which at various intervals has presented itself as logical theory to arrive at the conclusion that the differences in general spirit and in the mass of details far outbalance any agreement as to a few detached doctrines and technical symbols. If the survey were limited even to the period preceding the attempts at radical reformation of philosophy in general, and of logic as included therein, to the period in which the Aristotelian doctrines, as they may be called, formed the common basis of logical treatment, we should be able to detect differences of such a kind as to indicate radically distinct fundamental views. The scholastic logic, which, even by itself, cannot be regarded as one theory with unimportant modifications, is most falsely described as Aristotelian. The technical terminology, the general idea and plan, and some of the formal details are certainly due to the Aristotelian analysis of reasoned knowledge, but in spirit, in ruling principles, and in the mass of details, the method of the scholastic logic is alien to that of Aristotle.

Even more radical is the divergence of modern logic from the Aristotelian ideal and method. The thinker who claimed for logic a special preëminence among

sciences because "since Aristotle it has not had to retrace a single step, * * * * * and to the present day has not been able to make one step in advance," has himself, in his general modification of all philosophy, placed logic on so new a basis that the only point of connection retained by it in his system with the Aristotelian may be not unfairly described as the community of subject. Both deal in some way with the principles and methods of human thinking, but as their general views of the constitution of thought are diverse, little agreement is to be found in the special treatment of its logical aspect. So when a later writer prefaces his examination of logical principles with the declaration that "logic is common ground on which the partisans of Hartley and of Reid, of Locke and of Kant, may meet and join hands," we are not unprepared for the result that, with a few unimportant exceptions, his views of logical principle coincide with those of no recognized predecessor in the same field, diverge widely from either the currently received or the genuine Aristotelian doctrines, and lead to a totally new distribution, in mass and detail, of the body of logical theorems and discussions. Such divergence is, indeed, most intelligible. If one reflects on the significance which would be attached in any one of these logical systems, of Aristotle, of Kant, of Mill, to the *universal* or universalizing element of thought, and on the fact that such universal must manifest itself as the characteristic feature in all the important products of thinking, the notion, the judgment, the syllogism, the conclusion is inevitable that difference of view in respect to the essence must make itself felt in difference of treatment of details. The ultimate aim of proof, and the general nature of the methods of proof, must appear differently according as the accepted ground is the Aristotelian conception of nature and thought, the Kantian theory of cognition, or subjective empiricism.

If, adopting a simpler method, one were to inspect a fair proportion of the more extensive recent works on logic, the conclusion drawn would be probably the same—that, while the matters treated show a slight similarity, no more than would naturally result from the fact that thought is the subject analyzed, the diversity in mode of treatment is so great that it would be impossible to select by comparison and criticism a certain body of theorems and methods, and assign to them the title of logic. That such works as those of Trendelenburg, Ueberweg, Ulrici, Lotze, Sigwart, Wundt, Bergmann, Schuppe, De Morgan, Boole, Jevons, and these are but a selection from the most recent, treat of notions, judgments, and methods of reasoning, gives to them indeed a certain common character; but what other feature do they possess in common? In tone, in method, in aim, in fundamental principles, in extent of field, they diverge so widely as to appear, not so many different expositions of the same science, but so many different sciences. In short, looking to the chaotic state of logical textbooks at the present time, one would be inclined to say that there does not exist anywhere a recognized, currently received body of speculations to which the title logic can be unambiguously assigned, and that we must therefore resign the hope of attaining by any empirical consideration of the received doctrine a precise determination of the nature and limits of logical theory.

LOGOS. This term is one of the most constant factors in ancient speculation. As it is double-sided, however, expressing both *reason* and *word*, the conceptions which it covers differ widely. Taken broadly, the doctrine of the Logos may be said to have run in two parallel courses—the one philosophical, the other theological; the one the development of the Logos as

reason, the other the development of the Logos as word; the one Hellenic, the other Hebrew.

To the Greek mind, which saw in the world a *Kosmos*, it was natural to regard the world as the product of reason, and reason as the ruling principle in the world. So we find a Logos doctrine more or less prominent from the dawn of Hellenic thought to its eclipse. It rises in the realm of physical speculation, passes over into the territory of ethics and theology, and makes its way through at least three well-defined stages. These are marked off by the names of Heraclitus of Ephesus, the Stoics, and Philo.

It acquires its first importance in the theories of Heraclitus. There it is intimately associated with the dominant ideas of a flux in all things, and of fire as the material substrate or primary form of existence.

This Logos is not one above the world or prior to it, but in the world and inseparable from it. Man's soul is a part of it. It is *relation*, therefore, as Schleiermacher expresses it, or reason, not speech or word. And it is objective, not subjective, reason. The process of transition between opposites, in which all things are involved, is a process according to orderly relations and definite measures, and the Logos is the eternal principle of this world-process which shows itself in the form of a constant conflict between opposites. Like a law of nature, objective in the world, it gives order and regularity to the movement of things, and makes the system rational.

Between Heraclitus and the Stoics comparatively little was done in developing a special Logos doctrine. With Anaxagoras a conception entered which gradually triumphed over that of Heraclitus, namely, the conception of a supreme, intellectual principle, not identified with the world, but independent of it. This, however, was *nous*=reason, not Logos. In the Platonic and Aristotelian systems, too, the Logos appears. But it is subordinate to other more distinctive conceptions, and lacks the definiteness of a doctrine. With Plato the term selected for the expression of the principle to which the order visible in the universe is due is *nous*=reason or *sophia* (wisdom), not Logos. It is in the pseudo-Platonic *Epinomis* that Logos appears as a synonym for *nous*=reason. In Aristotle, again, the principle which sets all nature under the rule of thought, and directs it toward a rational end, is *nous*=reason, or the divine spirit itself; while Logos is a term with many senses, used as more or less identical with a number of phrases.

With the Stoics, however, the Logos doctrine reappears in great breadth. It is a capital element in their system. With their teleological views of the world they naturally predicate an active principle in connection with it, living in it and determining it. This operative principle is called both Logos and God. It is conceived of as material and is described in terms used equally of nature and of God. The Logos of the Stoics is a reason in the world gifted with intelligence, and analogous to the reason in man.

In the period between the Stoics and Philo there are few names of distinct interest in this connection. But in the Alexandrian philosophy the Logos doctrine assumes a leading place, and shapes a new career for itself. The chief representative of this school is the Hellenized Jew, Philo, (born about 25 B.C.) With him God is absolute and incorporeal perfection, apprehensible only by reason, and incapable of contact with matter. An intermediate agent, therefore, is affirmed, the Logos or idea of ideas. This Logos is not eternal in the sense in which God is eternal, but has its being from Him. It is His elder son, as the world is His younger. It resides with God as His wisdom, and is in the world as the divine reason.

The doctrine of the Logos in Hellenic thought remains substantially a doctrine of the Logos as reason. The other side, the doctrine of the Logos as word, belongs as essentially to Hebrew thought. The roots of this conception lie in the Hebrew Scriptures. The God who is made known in the Old Testament is one who reveals Himself actively in history. He is exhibited, therefore, as speaking, and by His word communicating His will. The word of the God of revelation is represented as the creative principle, as the executor of the divine judgments, as healing, as possessed of almost personal qualities. Along with this comes the doctrine of the angel of Jehovah, the angel of the covenant, the angel of the presence, in whom God manifests Himself, and who is sometimes identified with Jehovah or Elohim, sometimes distinguished from Him, and sometimes presented in both aspects.

The Hebrew Logos and the Old Testament doctrine reach their climax in the prologue to John's Gospel. The three conceptions of the active Word, the Angel, and the Wisdom of God, which had been fused in the Rabbinical idea of a Memra, meet there in the final grandeur of the Word of God incarnate. The question of the *genesis* of the Johannine doctrine has been greatly debated. There is a remarkable similarity between John's terms and Philo's. But this is due mainly to the fact that John and Philo made use of the same inherited phraseology for the expression of their several doctrines. The Johannine doctrine is not derived from the Philonic. The Logos of Philo is distinctively reason; the Logos of John is Word. The one is metaphysical; the other is theological. In Philo the Logos is the divine principle that creates and sustains. In John the Logos who creates also redeems. In Philo the Logos hovers midway between the personal and the impersonal. In John he is a distinct personality. To Philo the idea of an incarnation of God is alien and abhorrent. The heart of John's doctrine is the historical fact that the Word was made flesh.

LOGRONO, an inland province of Spain, the smallest of the eight modern divisions of Old Castile, is bounded on the north by Burgos, Alava, and Navarre, on the east by Navarre and Zaragoza, on the south by Soria, and on the west by Burgos. The area is 1,945 square miles, with a pop. (1898) of 186,223.

LOGRONO, capital of the above province, is situated on the right bank of the Ebro, which is here crossed by a handstone bridge of twelve arches, dating from 1138; the surrounding plain is well cultivated and fertile, producing the rich Rioja wine. The population is 15,500; the trade and industries are unimportant.

LOGWOOD is a valuable dyewood, the product of a leguminous tree, *Hematoxylon campechianum*, native of Central America, and grown also in the West Indian Islands. The tree attains a height not exceeding forty feet, and is said to be ready for felling when about ten years old. The wood, deprived of its bark and its sapwood, is sent into the market in the form of large blocks and billets. It is very hard and dense, and externally has a dark brownish-red color; but it is less deeply colored within. The best qualities come from Campeachy, but it is obtained there only in small quantity. A large export trade in logwood of good quality is carried on from Honduras and Jamaica, and inferior qualities are exported from St. Domingo, Martinique, Guadalupe, etc. The wood was introduced into Europe as a dyeing substance soon after the discovery of America, but for many years (from 1581 to 1662) its use in England was prohibited by legislative enactment on account of the inferior dyes which at first were produced by its employment.

LOHARDAGÁ, or LOHARDUGGA, a district in the

lieutenant-governorship of Bengal, India, comprises Chutiá Nágpur proper, and the Palámau subdivision. Chutiá Nágpur is an elevated table-land, forming the central and southeastern portion of Lohárdagá district; its surface is undulating, and the slopes of the depressions lying between the ridges are cut into terraces covered with rice. Palámau, which forms the northwestern portion of the district, consists on the east and south of spurs thrown off from the plateaus of Hazáribágh and Chutiá Nágpur, while the remainder of the tract is a tangled mass of isolated peaks and long, irregular stretches of broken hills. The census of 1872 disclosed a total population of 1,237,123 (621,548 males and 615,575 females), spread over an area of 12,044 square miles.

LOIRE, the first of the rivers of France in length of course (626 miles) and extent of basin (44,979 square miles), has its headwaters in the great central plateau, and is considered to take its rise in the Gerbier de Jonc, in the department of Ardèche, at a height of 4,504 feet above the sea—though the Allier branch, which has its source about thirty miles west, in the department of Lozère, at the foot of Maure de la Gardille, 4,668 feet above the sea, has an almost equal course. The two streams continue to run parallel till the upper Loire turns westward and is joined by the Allier in the neighborhood of Nevers. All the more important affluents of the upper and middle part of the Loire—as the Cher, the Indre, the Vienne, respectively 198, 152, and 231 miles in length—have their gathering grounds in the central plateau. In the northeast the basin of the Seine comes so close (at one place to within six or seven miles) that the versant toward the Loire has hardly anything to contribute; and it is not till within sixty-five miles of the estuary that we find an important tributary, the Maine, bringing down the drainage of the Brittany plateau. At certain seasons the Loire is navigable for ships as far as Nantes (thirty-three miles), for boats as far as La Noirie (other 518 miles), and for rafts as far as Retournac; but for six months of the year navigation is practically impossible.

LOIRE, a department of central France, made up of the old district of Forez and portions of Beaujolais and Lyonnais, all formerly included in the province of Lyonnais, is bounded on the north by the department of Saône-et-Loire, on the east by those of Rhône and Isère, on the south by Ardèche and Haute-Loire, and on the west by Puy de Dôme and Allier.

LOIRE, HAUTE-, a department of central France, made up of Velay and portions of Vivarais and Gévaudan, three districts formerly belonging to the old province of Languedoc, of a portion of Forez formerly belonging to Lyonnais, and a portion of lower Auvergne, is bounded on the north by Puy de Dôme and Loire, on the east by Loire and Ardèche, and on the south by Ardèche and Lozère, and the west by Lozère and Cantal, having an extreme length of sixty-eight miles, a maximum breadth of fifty-four miles, and an area of 1,916 miles. It belongs almost wholly to the Loire basin, but a few square kilometers to the north of Mont Mézenc are drained by the Erioux, a tributary of the Rhone. The river Loire, to which the department owes its name, enters at a point sixteen miles distant from its source, and 2,923 feet above the level of the sea. Within the sixty-three miles of its course through the eastern portion of the department, first in a northerly and afterward in a northeasterly direction, it falls 1,565 feet. The Allier, which joins the Loire at Nevers, traverses the western portion of Haute-Loire in a northerly direction, entering at a point twenty-five miles distant from its source, and 2,369 feet above the sea; it traverses a narrow and deep valley overhung by lofty hills, and falls 1,090 feet. The capital is Puy. The population in 1901 was 306,671.

LOIRE-INFÉRIEURE, a maritime department on western France, is made up of a portion of Brittany on the right and of the district of Retz on the left of the Loire; being bounded on the west by the ocean, on the north by Morbihan and Ile-et-Vilaine, on the east by Marne-et-Loire, and on the south by Vendée. Its greatest length from east to west is seventy-six miles, its greatest breadth sixty-five miles, and its area 2,654 square miles. The surface is very flat, and the highest point, in the north on the borders of Ile-et-Vilaine, is only 377 feet. The Loire has a course of sixty-eight miles within the department; its width above Nantes varies from 1,300 to 3,280 feet, and its volume at Nantes, where the tide begins to be felt, is never under 700 cubic meters per second. It has numerous islands. Nantes is the capital. The population in 1901 was 656,998, a decrease of 13,000 since 1896.

LOIRET, a department of central France, made up of three districts of the ancient province of Orléanais—Orléanais proper, Gâtinais, and Dunois—together with portions of the Isle of France and Berri, is bounded on the north by Seine-et-Oise, on the northeast by Seine-et-Marne, on the east by Yonne, on the south by Nièvre and Cher, on the southwest by Loir-et-Cher, and on the northwest by Eure-et-Loir; its greatest length, from northwest to southeast, is seventy-five miles; its greatest breadth, from north to south along the meridian of Paris, fifty miles, and its area, 2,614 square miles. The name is derived from the Loiret, a stream which issues from the ground some miles to the south of Orleans, and after a course of about seven miles falls into the Loire; its large volume gives rise to the belief that it is a subterranean branch of that river. The Loire traverses the department by a broad valley which, though frequently devastated by vast floods, is famed for its rich tilled lands, its castles, its towns, and its vine-clad slopes. The capital is Orleans. The population in 1901 was 363,812, a decrease of 4,958 since 1896.

LOIR-ET-CHER, a department of central France, consists of a small portion of Touraine, but chiefly of portions of Orléanais proper, Blésois, and Dunois, districts which themselves formerly belonged to Orléanais. It is bounded on the north by Eure-et-Loir, on the northeast by Loiret, on the southeast by Cher, on the south by Indre, on the southwest by Indre-et-Loire, and on the northwest by Sarthe, the greatest length (northwest to southeast) being seventy-eight miles, maximum breadth thirty-one miles, and the area 2,452 miles. Its name is derived from the Loir and the Cher, by which it is traversed in the north and in the south respectively. The Loire divides it into two nearly equal portions, the district on the right of the Loire being known as Beauce, while that on the right of the Loir again is called Perche; and on the left of the Loire is Sologne. Population (1901), 274,836.

LOJA, or LOXA, a town of Spain, in the province of Granada, lies in a beautiful valley through which flows the Genil, here crossed by a Moorish bridge, about thirty-three miles by rail west from Granada. Population, 20,000.

LOKEREN, a town of Belgium, in the province of East Flanders and district of Termonde. The population of the commune has increased from 11,960 in 1808 to 18,500 in 1900.

LOKMAN, a name famous in Arabian tradition. The Arabs distinguish two persons of this name. The older Lokmán was an 'Adite, and is said to have built the famous dyke of Ma'rib. He not only escaped the destruction sent on his nation for their refusal to hear the prophet Húd, but received the gift of a life as long as that of seven vultures, each of which is said to have lived eighty years. The other Lokmán, called "Lok-

man the sage," is mentioned in the Koran. He is said to have been a Nubian slave, son of 'Anká, and to have lived in the time of David in the region of Elah and Midian, but the commentators on the Koran make him son of Bá'úrâ, the son of Job's sister or daughter. This form of the legend, and many of the stories told of him, show Jewish influence on the legend, and Derenbourg has pointed out that Bá'úrâ seems to be identical with Beor, and that Lokmán corresponds to Balaam, the roots of both names meaning "to swallow," so that the one may be viewed as a translation of the other.

LOLLARDS, THE, were the English followers of John Wycliffe, and were the adherents of a religious movement which was widespread in the end of the fourteenth and beginning of the fifteenth centuries, and which, to some extent, maintained itself on to the Reformation. The name is of uncertain origin; it has been traced to a certain Walter Lollard, but he was probably a mythical personage; but the most generally received explanation derives the word from *lollen* or *lullen*, to sing softly. The word is much older than its English use; there were Lollards in the Netherlands as early as the beginning of the fourteenth century, who were akin to the Fratricelli, Beghards, and other sectaries of the recusant Franciscan type. It is probable that the name was given to the followers of Wycliffe because they resembled those offshoots from the great Franciscan movement which had disowned the pope's authority and separated themselves from the mediæval church.

Lollardy was most flourishing and most dangerous to the ecclesiastical organization of England during the ten years after Wycliffe's death. It had spread so rapidly and grown so popular that a hostile chronicler could say that almost every second man was a Lollard. Wycliffe left three intimate disciples—Nicolas Hereford, a doctor of theology of Oxford, who had helped his master to translate the Bible into English; John Ashton, also a fellow of an Oxford college, and John Purvey, Wycliffe's colleague at Lutterworth, and a co-translator of the Bible. With these were associated more or less intimately, in the first stage of Lollardy, John Parker, the strange ascetic William Smith, the restless fanatic Swynderly, Richard Waytstract, and Crompe; and there must have been a large number of preachers who itinerated through England preaching the doctrines of their master.

LOMBARD, PETER, bishop of Paris, better known as *Magister Sententiarum*, the son of obscure parents, was born about the beginning of the twelfth century at Novara (then reckoned as belonging to Lombardy). After receiving his education in jurisprudence and the liberal arts at Bologna, he removed to France, bearing a recommendation to Bernard of Clairvaux, who first placed him under Lotolf at Rheims, and afterward sent him to Paris with letters to Gilduin, the abbot of St. Victor. His diligence and talents soon brought him into notice, and ultimately obtained for him a theological chair, which he held for a number of years; during this period he is said to have been the first to introduce theological degrees. On June 29, 1159, he succeeded his former pupil, Philip, brother of Louis VII., in the bishopric of Paris, but did not long survive the promotion; according to the most trustworthy of the meager accounts we have of his life, he died on July 20th of the following year.

LOMBARDS. The history of the Lombards falls into three divisions: (1) The period before the invasion in 568 A.D.; (2) the Lombard kingdom in Italy between 568 and 774; (3) the period of their incorporation with the Italian population, and the history of

Lombardy and its cities as one of the great provinces of Italy—from the restoration of the empire under Charles the Great (800) to the peace of Constance with Frederick Barbarossa (1183), and from the declaration of independence to the time of the tyrannies, and, afterward, of the French, Spanish, and Austrian rule.

1. The name of *Lombard* is the Italianized form of the national name of a Teutonic tribe, *Longobardi*, itself an Italian arrangement, based on a supposed etymology of the Teutonic *Langbard*, *Langobardi*, the form used when they are first named by Roman writers—Velleius and Tacitus. The etymology which made the name mean *Longbeard* is too obvious not to have suggested itself to Italians, and perhaps to themselves; it is accepted by their first native chronicler, Paul the Deacon, who wrote in the time of Charles the Great. But the name has also been derived from the region where they are first heard of. On the left bank of the Elbe, "where Börde or Bord still signifies a fertile plain by the side of a river," a district near Magdeburg is still called the *Lange Börde*; and lower down the Elbe, on the same side, about Lüneburg, the *Bardengau*, with its *Bardewik*, is still found; it is here that Velleius, who accompanied Tiberius in his campaign in this part of Germany, and who first mentions the name, places them. As late as the age of their Italian settlement the Lombards are called *Bardi* in poetical epitaphs, though this may be for the convenience of meter.

Their own legends bring the tribe as worshippers of Odin from Scandinavia to the German shore of the Baltic, under the name of *Winili*, a name which was given to them in a loose way as late as the twelfth century. By the Roman and Greek writers of the first two centuries of our era they are spoken of as occupying, with more or less extension at different times, the region which is now Hanover and the Altmark of Prussia. To the Romans they appeared a remarkable tribe. Tacitus describes them as a race which, though few in numbers, more than held their own among numerous powerful neighbors by their daring and love of war. In the quarrels of the tribes they appear to have extended their borders; in Ptolemy's account of Germany, in the second century, they fill a large space among the races of the northwest and north. But from the second century the name disappears, till it is found again at the end of the fifth century as that of a half Christian tribe on the northern banks of the Danube. We know nothing of the way in which Christianity was introduced among them, probably only among some of their noble families; but they were Arians like their neighbors and predecessors in Italy, the Goths, and like them they brought with them into Italy a hierarchy of bishops, priests, and deacons. While the Gothic Bible of Ulfilas is partially preserved, whatever religious literature the Langobards had in the shape of versions of the Scriptures or liturgical forms has utterly perished. They were among the Teutonic tribes which were generally on good terms with the empire, and were encouraged by it in their wars with their more barbarous neighbors.

LOMBOK (called Tanah Sasak by the natives, and Saliparan or Selaparang by the Balinese, Lombok being properly the name only of a village on the northeast side), an island of the East Indian Archipelago, belonging to the Lesser Sunda group, and separated from Bali by the Strait of Lombok, from Sumbawa by the Strait of Alas. Its area is estimated at 2,080 square miles.

LOMONOSSOFF, MIKHAIL VASILIEVICH, was born in the year 1711. His *Ode on the Taking of Khotin from the Turks* was composed in 1739, and attracted a great deal of attention at St. Petersburg. During his residence in Germany Lomonossóff married a native of the country, and found it difficult to maintain

his increasing family on the scanty allowance granted to him by the St. Petersburg Academy, which, moreover, was irregularly sent. His circumstances became embarrassed, and he resolved to leave the country secretly, and to return home. On his arrival in Russia, after an adventure with a Prussian recruiting officer which at one time threatened serious consequences, he rapidly rose to distinction, and was made professor of chemistry in the university of St. Petersburg; he ultimately became rector, and in 1764 secretary of state. He died in 1765.

LOMZA, or LOMZHA, a government of Russian Poland, is bounded on the north by Prussia and the Polish government of Suwalki, on the east by the Russian government of Grodno, on the south by the Polish governments of Siedlce and Warsaw, and on the west by that of Plock. It covers an area of 4,667 square miles, or 9½ per cent. of all Poland. Pop. (1898), 585,781.

LOMZA, capital of the above province, on the Nareff, eighty miles northeast from Warsaw, and thirty miles north from the Chizheff station of the railway between Warsaw and Grodno, had a pop. (1898) of 26,075.

LONACONING, a post village of Alleghany county, Md., with a population of 2,181. Its principal wealth consists in the coal-mines of the neighborhood.

LONDON, the metropolis of England and the largest city of the world, is situated on both banks of the Thames river, about fifty miles from its mouth. Ocean-going vessels can come up to London Bridge, in the heart of the city, but the docks are located further down the river. The tide is felt as far as Teddington, twelve miles above the city. London occupies a vast amphitheater rising gradually from the water level to the heights of Hampstead and Highgate, some 400 feet above the sea. It is located on the London Clay, a unique formation, and in great part its buildings have been constructed from the brick earth found within its own limits. The city extends into four counties: Middlesex, Surrey, Kent, and Essex. It is almost impossible to define the extent of London, the artificial limits varying so much.

The city proper covers but one square mile; the London of the postal service, as shown by the directory, includes an irregular space some ten miles by twelve, and the metropolitan police district covers perhaps double this amount of territory. At the last official census, taken in 1881, the metropolitan and city police districts, covering 117 square miles, had a population of 4,536,063 in 1901.

London was undoubtedly a city of importance before the Roman invasion. Under its old name of Londinium it was reckoned as the second city of Britain in the time of Caesar. St. Albans alone excelling it in population. There seems to be no reason for doubting the assertion that the earliest church of St. Paul was built upon the site of a temple of Diana during the fourth century. Tacitus speaks of London as an important commercial center, surrounded by walls and with gates, traces of which still survive. That Julius Caesar built a fort on the site of the present Tower is unquestioned. Dion Cassius, writing in the third century, tells of a bridge over the Thames, on the site of the present London bridge. As the river at this point is 1,000 feet wide, with a tidal rise and fall of twenty feet, it is certain that only the necessities of an important town could justify the building of such a structure. It is probable that after the abandonment of England by the Romans in the beginning of the fifth century the city of London retrograded both in population and in commercial importance. That it was several times plundered and held to ransom by the Danes we know, and we know, also, that by the year 1000 it had become strong enough to resist the attacks of the predatory Norsemen.

The earliest charter of the city proper (still in existence) was given by William the Conqueror to "William the Bishop and Godfrey the Portreeve." It guaranteed the freedom of the burgesses and reaffirmed the rights of London as a free city.

William I. built the Tower, and his son and successor, William Rufus, began the construction of Westminster Hall, still standing. In the Middle Ages the greater part of the land within the limits of London passed into the hands of the church. The Knights Templar secured a location, and the various orders of white and black friars acquired thousands of acres of valuable property. In 1189 the first mayor of the city was elected. The Plantagenet and Lancastrian kings made London their headquarters, and the possession of the Tower became equivalent to the possession of the crown. Edward I. antagonized the citizens and deprived them of the right of electing a mayor, but had to give up his claims later, and since that date London has chosen its own chief magistrate.

The city had attained in Tudor times (*circa* 1485-1603) to an importance relatively equal to that which it now holds. From Elizabeth down to William III. efforts were made to limit its growth, but of course without success. From time to time it was devastated by plagues, the last of which occurred in 1665. In the following year occurred what is known as the "Great Fire." This catastrophe swept out of existence two-thirds of the city proper. The rebuilding of London, under the direction of Sir Christopher Wren, occupied nearly thirty years. During the reigns of the earlier Hanoverian sovereigns London developed from a congeries of scattered villages and hamlets into a homogeneous community.

Within the present century its growth has been marvelous. Since 1840 it has added to itself in each decade at least 500,000 population. The introduction of railroads necessitated the pulling down of thousands of buildings occupied by the artisan class, and the transference of the residential population to the suburbs. Within the last quarter of a century the improvements in sewerage, new thoroughfares, and intra-mural transportation have been wonderful. As business has extended the moneyed class have migrated westwardly and the houses which a hundred years ago formed the homes of the aristocracy are to-day tenements or business buildings. The City of London has retained its municipal superiority for many hundred years. The outside villages, hamlets, and towns continued for many centuries to be governed in the same manner as other rural corporations; but in 1888 imperial legislation was had and the "County of the City of London" was constituted. Under this system London, with its nearly 5,000,000 of people, forms an *imperium in imperio*, and its annual receipts and expenditures for lighting, paving, policing, education, and kindred objects equal those of many European nations.

London owes the possession of its finest parks rather to accident than to intention. Eastward and northward no effort was made to preserve any part of the "delightful plain of meadowland interspersed with flowing streams" mentioned by Fitzstephen, or of the "immense forest of densely wooded thickets," or of the "common fields" in the great fen, notwithstanding the riot of the citizens in the reign of Henry VIII. against the invasion of their rights by inclosure. Westward, however, the inroads of the builder were interrupted by the royal parks, which, lying adjacent to each other, cover an area of about 900 acres. St. James' Park, eighty acres, transformed from a swamp into a deer park, a bowling green, and a tennis court by Henry VIII., extended and laid out as a pleasure ground by Charles II.,

and rearranged by Nash (1827-29), possesses beautiful combinations of water and foliage. Green Park, seventy acres, lying between St. James' Park and Piccadilly, is unadorned except by rows of trees and by parterres of flowers bordering Piccadilly. Hyde Park, 300 acres, stretches westward from the district of Mayfair to Kensington Gardens. Originally forming part of the manor of Hyde, which was attached to Westminster Abbey, Hyde Park at the dissolution of the monasteries was taken possession of by Henry VIII. In 1652 the park, which then included a large portion of the ground now joined to Kensington Gardens, and extended to 621 acres, was sold for £17,068, 6s. 8d., but in 1660 it was rebought by the crown, having some time before this become the great "rendezvous of fashion and beauty." It possesses nine principal gateways, of which that at Hyde Park Corner on the southeast and the Marble Arch on the northeast present the most striking features. The former, designed by Decimus Burton and erected in 1828 at a cost of £17,000, consists of three imposing arches adorned with reliefs copied from the Elgin marbles. The Marble Arch, originally intended as a monument to Nelson, was first erected at a cost of £80,000, in front of Buckingham Palace, and was placed in its present position in 1851.

With its fine expanse of grass, its bright flower beds and clumps of shrubbery, its noble old trees, its beautiful ornamental lake the Serpentine, its broad avenues crowded with equipages, its Rotten Row alive with equestrians, its walks lined with thousands of loungers of very various nationalities, professions, and grades of social position, Hyde Park in the height of the season presents a scene which in the brilliancy of its *tout ensemble* and its peculiarly mingled contrasts can probably be paralleled nowhere else. In the seventeenth and eighteenth centuries Hyde Park was a favorite meeting place for duellists, and in the present century has been frequently the scene of great political gatherings. To the west are Kensington Gardens, 360 acres, originally attached to Kensington Palace, and enlarged in the reign of George II. by the addition of nearly 300 acres taken from Hyde Park. They are more thickly planted than the "Park," and also contain an avenue of rare plants and shrubs, and several walks lined with flowering trees. Regent's Park in the northwest, 470 acres, occupying the site of Marylebone Park, which in the time of Elizabeth was used as a hunting ground, owes its preservation to the intention of George III. to erect within it a royal palace. It contains the gardens of the Zoological Society and of the Royal Botanic Society, as well as the grounds of a few private villas. The northern half of the park is in summer devoted to cricket; in the southeast corner there is a flower garden of rather antique design; and in the southwest a portion bounded on the north by an artificial lake is let to private householders. To the north of Regent's Park there are about twelve acres of open ground surrounding Primrose Hill, 220 feet, commanding an extensive view of London. Battersea Park, 180 acres, formed (1852-58) at a cost of £312,890, on the south side of the Thames, besides a fine promenade along the banks of the river, several walks and carriage drives bordered with parterres, and a wide expanse for cricket and other amusements, contains a subtropical garden, which during August and September possesses much of the witchery of an ideal fairy-land. East London, after the inclosure of Finsbury Fields, had no special recreation ground until the opening of Victoria Park, which was sanctioned by an act of Parliament in 1842, and was in 1872 increased to about 300 acres. Finsbury Park, 115 acres, formed by the Metropolitan Board of Works from the grounds of Hornsey Wood House at a cost of

£112,000; Southwark Park, Rotherhithe, sixty-three acres, formed at a cost of £111,000; West Ham Park in the extreme east, partly purchased by the city corporation; Greenwich Park (see GREENWICH); and the gardens on the Thames embankment, with various squares and semi-private gardens, sum up the other ornamental open spaces of London.

The Metropolitan Board, under various acts of Parliament, have secured the exclusive right of the public in several commons and open spaces, which with the parks under their care comprise together an area of 1,698 acres, giving with the royal parks and Battersea Park, Victoria Park, and West Ham Park a total of over 3,000 acres, or about a twenty-fifth part of the whole metropolitan area. The principal public commons are Hampstead Heath, a wild, hilly region now encroached on by buildings on all sides except the north and northwest, commanding fine views of both London and the country, and, with its clear bracing air and its unkempt and rugged beauty, breaking on the visitor with all the effect of a sudden surprise; Blackheath Common, 267 acres, a bare sandy expanse to the south of Greenwich Park, containing a good golfing course; Clapham Common, 220 acres; Wormwood Scrubs, 194 acres; the Tooting Commons, 207 acres; and Plumstead Common, 110 acres. The total sum expended by the Board of Works in the purchase, preservation, and adornment of parks and open spaces up to December 31, 1881, was £436,760. All the parks and open spaces already mentioned are included in the Metropolitan Board district, but outside this area there is in the neighborhood of London a large number of uncultivated spaces to which the public have various rights, some of them of an obscure and undefined character.

The water supply of London is derived from the upper waters of the Thames and the Lea, and from the New river, an artificial stream or conduit, built in James I.'s time. The supply of water is intermittent, and in this respect London is far behind many cities. The gas supply is in the hands of various companies, and the street railroad and omnibus lines are controlled by private enterprise. London has not less than 12,000 omnibuses, and at least as many cabs. It has a system of underground railroads, forming a double circle, and extending far out into the suburbs. The elevated railroad system is unknown in London. Within the corporate bounds there are no less than 730 railroad stations. For the convenience of the artisan class these railroads are compelled by parliamentary enactment to run trains during certain hours, morning and evening, on which the fare for the round trip (twenty-two miles) is only 4 cents. The street-car fares are limited to 2 cents, and for this price a seat must be provided for every passenger. The fire and police departments of London are on a scale commensurate with the needs of the great city. London, being built principally of brick, is not compelled to maintain a fire department of the numerical strength required in many American cities. A fire in London means the probable burning-out of the building in which it originates, but does not imply any danger of spreading. Of course in a city of such enormous magnitude, the chosen home of thousands of continental refugees, there is a criminal class requiring an efficient police department to grapple with them. London has (not counting the city proper) over 12,000 policemen. The headquarters of the police department are at Scotland Yard, Whitehall, and the department is under the direct control of the imperial government. The drainage system of London dates back some thirty years.

Until 1531 no provision was made for the construction of underground main sewers, notwithstanding that

in 1290 the exhalations from the Fleet overcame the incense burnt at the altars in the neighboring churches, and that in 1307 the river, on account of the accumulation of filth, had become inaccessible for ships. The act of Henry VIII. in 1531, which provided for the appointment of a commission of sewers, was renewed in 1548 by Edward VI., and extended in its application by James I. in 1607; and subsequently separate commissions were granted as the population extended to other districts. The most important work of the old commission of sewers was the bridging over of the Fleet in 1637. In 1841 this sewer, which drained an area of over 400 acres, was widened at the cost of about £47,000, and at its mouth an iron culvert was provided which carried its discharge into the middle of the Thames. Other main sewers were constructed, but the bridging of them over was carried out slowly and in a very imperfect manner. In early times the nuisances were carried away by the scavengers and the sewage received into wells, which when full were pumped into the kennels of the streets. Until 1848 the discharge of house sewage into the main drainage was forbidden, and the construction of cesspools enforced, the majority of which were unprovided with overflow drains, but after 1810 there was considerable improvement in connection with the introduction of better arrangements for a supply of water. Under the auspices of the Metropolitan Commission of Sewers, created by the act of 1848, a more satisfactory system of local drainage was enforced; but its action in regard to the main sewage discharge was so dilatory that the pressure of public opinion led to the Metropolitan Local Management Act of 1855 providing for the creation of the Metropolitan Board of Works, in which was vested the care of the main sewers, and to which was intrusted the construction of works for their discharge at a distance from London regarded as sufficient to prevent the pollution of the river. Works were commenced in 1859, and completed in 1865 at a cost of £4,607,000, providing three lines of intercepting sewers on the north side of the river, which convey the discharge eleven miles below London Bridge, and two lines on the south side, which convey their discharge four miles farther down. These works comprise eighty miles of main intercepting sewers, in addition to four pumping stations to raise the sewage from the lower levels. The total length of the main street sewers intrusted to the board was about 165 miles, one-fifth of which consisted of offensive open sewers, while many of the others were of most defective design or out of repair. The total cost of repairing these sewers, and connecting them with the new main drainage system, was estimated at £800,000, and works to the value of £750,000 have been executed. The sum expended on main drainage and main sewers up to December 31, 1881, was £5,684,470. The opinion seems to be increasing that the present method of getting rid of the sewage of London is radically wrong, and undoubtedly the sewage discharge may reach proportions which may absolutely demand a new supplemental scheme. For the four years ending 1878 the average daily sewage discharge was 122,500,000 gallons, in 1878 it was 157,500,000, and it is now estimated at 180,000,000.

It is claimed on behalf of London that its death-rate is lower than that of any other great city, not being more than 22 per 1,000. In this respect there has been a great gain within the past half century, but much still remains to be done. London is not the largest manufacturing district of England, being excelled by Lancashire, where an aggregation of cotton-spinning towns outranks it. Its sea-borne commerce is enormous, but the volume of tonnage is exceeded by that of Liver-

pool, and its ship-building industry is inferior to that of the Clyde. But London has a practical monopoly of the East India trade, and its commerce with Antwerp, the Mediterranean and the Levant ports is very large. It has also an import trade with Russia.

Notwithstanding its magnificent location London occupies a very inferior position with respect to its public buildings. Its great cathedral is hidden by warehouses and paltry business structures, and its famous Abbey of Westminster and new Palace of Justice are equally badly situated. The various palaces of the crown are architecturally scarcely worthy of notice, and the columns, statues, and other supposed adornments of the city rebel alike against good taste and æsthetic culture. London has no boulevards (excepting the Thames embankment) to compare with those of Paris, and no commercial buildings worthy of the name. It is a wilderness of houses; "a province covered with brick." The city grew without forethought or provision, and it is only within the last fifty years that any attempt has been made to improve it. It contains treasures of art hidden away in inadequate buildings, and conducts its enormous commerce in buildings which would disgrace a third-rate city. The streets are better paved and better lighted than those of any American city, but they are (especially in the city) narrow and crooked. Even Regent street, the great center of retail trade, is tame and dull. Probably the finest thoroughfare is that of Pall Mall, the home of the clubs.

BUSINESS AND GENERAL STATISTICS.

The business center of London is the Royal Exchange, which occupies a commanding position between Threadneedle street and Cornhill, at the principal convergence of the city thoroughfares. The first building, erected 1565-70 by Sir Thomas Gresham and presented to the city, was destroyed by the great fire, and the second, opened in 1669, was also burned in 1838. The present exchange (1839-44), designed by Tite and erected at a cost of £180,000, is a quadrangular structure with an imposing Corinthian portico at its principal entrance, and incloses a court surrounded by an ambulatory. It is in the open central area that the commercial transactions take place—the ground floor being occupied by shops and offices, and the principal floor by insurance companies and "Lloyd's rooms." The principal exchanges for special articles are the corn exchange in Mark lane, where the privilege of a fair was originally granted by Edward I.; the wool exchange in Coleman street; the coal exchange adjoining the custom-house, erected in 1849 in the Italian style, and consisting of a rotunda surmounted by a dome; and the auction mart for landed property in Tokenhouse Yard. The metal market is a very important one; and there is also a very large consignment of precious metals and diamonds, the workers in which are chiefly concentrated in the neighborhood of Clerkenwell. The Royal Mint, Tower Hill, erected in 1805 on the site of the Cistercian abbey of St. Mary, is the only mint in England for the fabrication of gold and silver coins, but bronze coins are chiefly made at Birmingham, and gold coinage is now also manufactured at Sidney and Melbourne. The principal markets now existing are Smithfield (central meat market and poultry market), Leadenhall (poultry and game), Billingsgate (fish), Covent Garden (fruit and vegetables), the cattle markets at Copenhagen Fields and Deptford, the Bermondsey leather market, and the Cumberland, Smithfield, and Whitechapel hay markets.

Some of the private banks now existing, such as Coutts' and Child's, date from the seventeenth century, and a new era in the financial history of London was

inaugurated in 1694 by the foundation of the Bank of England, of which a full account is given in the article BANKING. Until 1733 the business of the bank was carried on at Grocer's Hall. The present building, which covers about four acres, and was enlarged in 1770 and 1788 by Sir Robert Taylor and Sir John Soane, presents to the street a low triangular wall without windows, and almost entirely devoid of ornament except at the northwest corner, which was copied from the temple of the Sibyl at Tivoli. Until the establishment of the London and Westminster Bank in 1834, the Bank of England was the only joint-stock bank in London. The private and joint-stock banks which have offices in London now number over 150. The principal banks are members of the Clearing House near Lombard street, where a daily exchange of drafts or checks is effected. In one year the total amount of bills, checks, etc., paid at the Clearing House was £6,382,645,000. The extent of the commercial enterprise of London is strikingly indicated by the large number of companies with their field of operations chiefly in foreign countries, which have been projected in the city or have in it their headquarters.

The largest manufacturing industry in London is that of brewing, the number of common brewers being 110, who made use of 9,955,177 bushels of malt, while of the 412,192 barrels of beer exported from the United Kingdom 236,206 were from London. To supply the breweries with water, wells now require to be sunk below the chalk to the greensand.

Silk-weaving, which received a special impulse from the settlement of foreign refugees at Spitalfields after the revocation of the edict of Nantes, has within the last fifty years been in a stagnant condition, owing chiefly to the rivalry of Lancashire. The majority of the other manufactures are carried on in the neighborhood of the Thames. The ships built in London in 1888, which are principally yachts, numbered sixty-four, but their total tonnage was only 2,723. The principal shipbuilding yards are at the Isle of Dogs. Boat-building is extensively carried on at Chelsea and at several other places in the upper reaches of the river. There are large engineering-works at Lambeth and Millwall, potteries and glass-works at Lambeth, Whitefriars, and Southwark, tanneries at Bermondsey, chemical-works on the Lea, paper-works on the Wandle, and sugar-bakeries at Whitechapel. The cabinetmakers' shops are situated principally in the neighborhood of Shoreditch, but there are several adjoining Tottenham Court road and Hampstead road, where upholstery warehouses are very numerous. Lucifer match making gives employment to a large number of women and children in the eastern districts. There are extensive hat manufactories in Lambeth. The special manufactures in different parts of London are too numerous for mention. The principal depots of carriage-builders are in Long Acre. A large trade in second-hand clothing is done by the Jews at Houndsditch, especially on Sunday morning, and on the same day of the week there are bird and fancy animal fairs at Church street, Bethnal Green, and at St. Andrew's street, Bloomsbury, near the Seven Dials. The center of the wholesale book trade is in Paternoster row, but some of the principal publishers have their premises in the neighborhood of Covent Garden and still farther west. Fleet street is largely occupied with the offices of the London and the provincial daily newspapers, but the office of the *Times* is in Printing-house square. The weekly newspapers have their offices chiefly in streets running off the Strand.

PUBLIC BUILDINGS AND IMPROVEMENTS.

The Thames Embankment, with its marine wall of

large granite blocks facing the river, supports on the north side a spacious thoroughfare which forms one of the finest promenades in London. The total cost of the various portions of the embankment was over £3,000,000, the greater part of which is defrayed by the coal and wine duties levied by the City corporation. By the construction (1864-70) of that portion known as the Victoria Embankment, stretching from Blackfriars Bridge to Westminster, about thirty-seven acres of land have been reclaimed, of which nineteen are occupied by carriage and footways, seven and one-half have been conveyed to adjoining proprietors, and about eight have been formed into ornamental grounds. The Albert Embankment (1865-68), stretching on the south side of the river from Westminster Bridge to Vauxhall Bridge, includes about nine acres, which are now chiefly occupied by St. Thomas Hospital. The Chelsea Embankment (1871-74), which is the extension of one previously constructed between Vauxhall Bridge and Chelsea Hospital, involved the reclamation of about nine and one-half acres of ground, now occupied partly by a roadway seventy feet wide, and partly by a flower garden.

There are twelve bridges, other than railway bridges, over the Thames within the metropolitan area, the most easterly being London Bridge and the most westerly Hammersmith Bridge. Three of these, London Bridge, Southwark Bridge, and Blackfriars Bridge, are within the city area. New London Bridge, a noble structure by Rennie, was opened in 1831, having cost £1,458,311. As populous and busy commercial districts extend for several miles to the east on both sides of the Thames, it is not only totally inadequate for the requirements of traffic, but is also removed beyond many convenient lines of communication. Until 1769, when the Blackfriars Bridge was erected, London Bridge stood alone. Old Blackfriars Bridge was replaced in 1869 by the present one of five iron arches resting on granite, erected from the designs of Page at a cost of £320,000. Southwark Bridge, designed by Rennie, 1815-19, consists of three iron arches of great elegance resting on stone piers, and cost £800,000. The river is crossed by many railway bridges, and the Thames tunnel, begun in 1825 and completed in 1843, at a cost of £468,000, for the purposes of traffic, was purchased in 1865 by the Great Eastern Company, and is now used as a railway tunnel. A subway under the Thames from Tower Hill to Tooley street was constructed in 1869 at a cost of £16,000. The communication in the neighborhood of the river is greatly facilitated by the frequent passenger steamers.

A new bridge was constructed in the year 1893 below the Tower, and about a mile from London bridge. It is of novel construction, a bascule or lifting platform extending over the main channel to permit of the passage of large ships. While this bascule, or draw, is open for the passage of vessels, vehicles will be unable to pass, but foot passengers will cross by an upper platform to be reached by elevators.

The Guildhall, rebuilt by Dance, in 1789, contains the greater part of the walls of the old building of 1411, which was damaged by the fire of 1666, and also the crypt divided into three aisles by clustered columns of marble supporting a groined roof richly adorned with carvings. The principal front was restored in 1867, in the Gothic style. In addition to the great hall used for state banquets and receptions, the building contains the common council chamber, the aldermen's room, and several courts of justice. Adjoining the Guildhall is the free library of the corporation, and a museum of antiquities relating to the City. The Mansion House at the east end of the Poultry, erected in 1740, from the

Designs of Dance, is the official residence of the lord mayor. In addition to the justice room and various reception rooms, it contains the Egyptian hall, in which certain special banquets of the lord mayor are held.

The University of London, instituted in 1836, occupies a large college building in Gower street, and has over 2,000 students. Other noted institutions of learning are Christ's Hospital, the Charterhouse, St. Paul's School, Westminster School, Merchant Taylors', and the City of London School, which has a fine new building on the Thames embankment. Space would fail to catalogue the scientific societies, picture galleries, museums, and hospitals which abound on every hand. Of museums London possesses two on a scale of unexampled vastness, the British Museum and the South Kensington Museum. The zoological collection of the British Museum is still at Bloomsbury, but the departments of geology, mineralogy, and botany were removed in 1881 to a new building in Cromwell road, South Kensington, called the British Museum of Natural History. The British Museum at Bloomsbury, and the South Kensington Museum, which are more directly connected with art than science, are noticed under the heading ART. The Museum of Practical Geology, Jermyn street, occupies a building in the Italian Palazzo style, erected in 1850, by Pennethorne at a cost of £30,000. It was founded in 1835, in connection with the geological survey of the United Kingdom, and also contains specially fine collections illustrative of the application of the minerals and metals to the useful arts. In the Patent Office Museum at South Kensington there are many of the original examples of the greatest mechanical inventions of modern times; and the United Service Museum, Whitehall, possesses relics and models illustrative both of the art of war and of the great naval and military achievements of England.

Chief of the London churches are St. Paul's Cathedral and Westminster Abbey. The present St. Paul's, erected in 1675-97 from the designs of Sir Christopher Wren at a cost of £747,954, is built in the form of a Latin cross, the length being 500 feet, the breadth at the transepts 250 feet, and of the choir and nave 125 feet. The dome, which separates the two transepts and the nave and choir, rises to a height of 365 feet, or of 404 feet to the top of the cross by which it is surmounted, the height of the interior dome being 225 feet. The principal front to the west consists of a double portico of Corinthian pillars flanked by campanile towers 120 feet in height. The transepts are bounded by semicircular rows of Corinthian pillars. St. Paul's is remarkable chiefly for its massive simplicity and beautiful proportions. The interior is imposing from its vastness, but the designs of Wren for its decoration were never carried out. Some of the monuments of the old building are preserved in the crypt, where are also the tombs of Sir Joshua Reynolds, Dr. Samuel Johnson, J. M. W. Turner, Lord Nelson, the Duke of Wellington, and other distinguished men, especially admirals and generals.

Westminster Abbey, as the coronation church of the sovereigns of England from the time of Harold, and on account of its proximity to the seat of English government, has acquired a fame and importance which in a certain sense outvie those of St. Paul's. It occupies the site of a chapel built by Siebert, in honor of St. Peter, on a slightly elevated spot rising from the marshy ground bordering the Thames. The length of the church, including Henry VII.'s chapel, is 531 feet, or, excluding it, 416 feet, the breadth of the transepts 203 feet, the height of the church 102 feet, and of the towers 225 feet. The choir, where the coronation of

English sovereigns takes place, is a fine specimen of Early English, with decorations added in the fourteenth century, and contains among other tombs those of Siebert, king of the East Saxons, Anne of Cleves, and Edmund Crouchback, earl of Leicester. The north transept is occupied principally with monuments of warriors and statesmen, and in the south transept the "poet's corner" contains memorials of most of the great English writers from Chaucer to Thackeray and Dickens. The nave, with its clustered columns, its beautiful triforium, and its lofty and finely proportioned roof, is the most impressive portion of the interior. The monuments in its north and south aisles are of a very miscellaneous character, and commemorate musicians, men of science, travelers, patriots, and adventurers.

The more modern churches are chiefly in the Gothic style. Of the religious buildings connected with the numerous denominations and nationalities, few possess exceptional interest of either an antiquarian or an architectural character. St. George's Cathedral, Southwark (1848), designed by Pugin, is said to be the largest Roman Catholic building erected in England since the Reformation; and Ely Chapel, Holborn, the only remaining relic of the palace of the bishops of Ely, has lately been purchased and restored by the Roman Catholics. Among the chapels belonging to the Protestant dissenters the best known are perhaps Mr. Spurgeon's Tabernacle, the City Temple, and Christ Church, Newington. The Dutch Church in Austinfriars was presented by Edward VI. to Dutch residents in London in 1550; the nave is in the Decorated style of the thirteenth century.

Lambeth Palace, situated near one of the old hithes or landing-places of the Thames, came into the possession of the archbishops of Canterbury in 1197. The oldest portion of the present building, including the chapel in the Early English style, was erected by Archbishop Boniface (1244-70), but the Lollards' Tower, in which the Lollards were tortured and the earl of Essex was imprisoned, was built in 1434, and the great hall with an elaborate timber roof in 1663. The inhabited portion was erected 1828-48 from the designs of Blore. The adjoining church of St. Mary, the oldest part of which dates from the fourteenth century, contains the tombs of several archbishops, as does also the palace chapel. The library is noticed in LIBRARIES.

Of the palaces of the crown the chief are as follows:

St. James' Palace, which, after the destruction of Whitehall, continued to be the principal royal residence until it was nearly all destroyed by fire in 1809, with the exception of the old gateway, the chapel adjoining, and the presence chamber, was built by Henry VIII. for a country residence, instead of Kennington, on the site of an old hospital for lepers, founded in the twelfth century.

Buckingham Palace, the town residence of Queen Victoria, occupies the site of Buckingham House, purchased by George III. in 1761. The present building in the classic style was erected 1825-35 by Nash; a west wing, with a dull façade 460 feet in length, facing St. James' Park, being added in 1846, and a large ballroom in 1856. The picture gallery contains a specially fine collection of pictures by the great Dutch masters.

Kensington Palace, a favorite residence of several English sovereigns, is noticed under KENSINGTON. Marlborough House, built by the first duke of Marlborough in 1710 from the designs of Wren, came into the possession of the crown in 1817, and has been occupied by the Prince of Wales since 1863.

The Tower of London, to the east of the city on the left bank of the Thames, called by Fitzstephen the Palatine tower, was, according to tradition, originally

built by Julius Cæsar, but the nucleus of the present building was begun in 1078 by William the Conqueror, who erected the part now known as the White Tower to take the place of a portion of the walls and towers of the city which had been washed away by the Thames. This tower was completed in 1098 by William Rufus, who also began the St. Thomas Tower and the Traitor's Gate. Additions were made at various periods, especially by Henry III., who used it frequently as a residence; and it now occupies an area of thirteen acres, surrounded by a moat, constructed in 1190, inclosing a double line of fortifications, behind which is a ring of buildings consisting of various towers, and the barracks and military stores, while in the centre is the massive quadrangular White Tower, with Norman arches and windows, and adorned with a turret at each corner. The St. John's chapel in this tower is one of the finest and most complete specimens of Norman architecture in England. The tower of London has an extensive collection of armor, and is the repository for the regalia of England. The execution of the long list of important political prisoners confined in the Tower took place on the neighboring Tower Hill, and most of them were buried in the chapel of St. Peter ad Vincula.

The new palace of Westminster (1840-67), built at a cost of about £3,000,000 from the designs of Barry, for the Houses of Parliament, on the site of the old palace destroyed by fire in 1835, is a vast and ornate building in the Tudor-Gothic style, covering altogether an area of about eight acres. Toward the river it presents a very richly adorned and effective façade. At the north-east corner is the clock-tower, 320 feet in height, resembling the clock-tower at Bruges; above the dome over the central hall a spire rises to the height of 300 feet; and the Victoria tower, 340 feet, surmounts the royal entrance at the southwest corner. The central hall, which is entered by St. Stephen's Porch and St. Stephen's Hall, built above St. Stephen's Crypt, a portion of the old building, separates the House of Peers, which, along with the royal rooms, occupies the western portion of the building, from the House of Commons, to which the eastern portion is assigned.

The government offices, situated in Whitehall and Downing street, form several miscellaneous groups erected at different periods and in various styles of architecture. The Treasury, Whitehall (1737), containing the official residence of the premier, the Education Office, the Privy Council Office, and the Board of Trade, was improved in 1847 by the construction of a new façade designed by Barry. The Horse Guards, the headquarters of the commander-in-chief, an insignificant building with a central clock-turret, was erected in 1753 on the site of a guard-house built in 1631 for the security of Whitehall. The Admiralty, a plain structure with a Grecian façade, was erected in 1726. The new Public Offices, a fine range of buildings in the Italian style, erected from the designs of Sir Gilbert Scott at a cost of over £500,000, contain the Home, Foreign, Colonial, and Indian Offices, and various other departments. Somerset House, Strand (1776-86), a large quadrangular structure, the finest façade of which is that toward the river, occupies the site of a palace founded by Protector Somerset in 1547. It contains the Exchequer and Audit Office, the Inland Revenue Office, the Office of the Registrar-General, the Admiralty, Register, and the Prerogative Will Office, removed from Doctor's Commons in 1874. The other government offices at present occupy unpretentious buildings in various streets, chiefly in the neighborhood of Whitehall and Westminster. Herald's College (College of Arms), the authority in regard to pedigrees and armorial bearings, is located in Queen Victoria street,

in a building reërected in 1683 from the design of Wren. The General Post-Office, St. Martin's-le-Grand, City (1825-29), designed by Smirke in the Grecian style, and occupying the site of St. Martin's church and abbey, will probably soon be removed farther westward. The General Telegraph Office, opposite the Post-Office, was erected 1870-73 at a cost of £450,000. The new Record Office in the Tudor style (1851-56) is situated in Fetter lane.

The law courts, which are described in the article ENGLAND, and were accommodated in Lincoln's Inn, and in buildings adjoining Westminster Hall, where they were first established in 1224, have all been removed to the New Law Courts in the Strand, designed by Street, and costing about £500,000.

STATISTICAL AND GENERAL.

The annual income of the various charitable institutions in London is now over £4,000,000, of which at least three-fourths is spent in London. That of the endowed parochial charities of the City of London in 1865 was £64,500, which by 1881 had increased to £116,960, those of Westminster being in the same years £26,555 and £33,124. The income of the charities of the Livery Companies in 1869 was stated to be £99,027, and now the 1,028 charities belonging to the companies have an aggregate income of £185,829, representing a capital value of £4,456,768. The amount spent on education is £65,130, and on doles £108,498. In addition, the charities of the corporation probably possess an annual income of £30,000.

The School Board of London has in regard to education a rating and legislative authority over a district corresponding with that of the Metropolitan Board of Works. The metropolitan police force outside the city limits and within a radius of twelve miles of Charing Cross is under the control of the home secretary. The Tower of London is governed by the constable of the Tower, assisted by fifty magistrates, and the borough of Westminster is still under the nominal care of the dean and burgesses. The Metropolitan Asylums Board, the Burial Board, the Thames Conservancy Board, and the Lea Conservancy Board constitute the principal other direct governing authorities having relation to London, but the water and gas companies enjoy monopolies which imply a certain degree of irresponsible authority, and a right of taxation not sufficiently defined and limited. Within an area less than the district of the Board of Works there are ten parliamentary boroughs, which return in all twenty-two members, the City returning four members, and Southwark (from 1295), Westminster (1547), Marylebone (1832), Finsbury (1832), Tower Hamlets (1832), Greenwich (1832, extended in 1868), Lambeth (1832), Hackney (1868), and Chelsea (1868), two each. London University (1868) returns one member.

The day census of the city taken in 1866 shows that the number of persons employed daily within its limits was 170,133, and that of 1881 gives a day population of 261,061, while the night population in 1871 was 74,897, and in 1881 only 50,526. The rapidity of the growth of London is largely due to the peculiar development of its trade and commerce, and is also closely connected with the interest excited by politics and the meetings of parliament. The bonds of connection between London and England thus pulsate daily with a manifold vitality. London is the emporium of England, the center of its great monetary transactions, the home of its science, literature, and art, and the yearly resort of its aristocratic and landed proprietor classes. Since the beginning of the century its rate of increase has exceeded that of England generally.

The proportion of inhabitants born outside its limits amounts to one-third of its entire population. The number of the natives of European states is in excess of those born in Scotland, and that of the natives of Ireland is about double, while the natives of the counties of England and Wales amount to more than a million. Irishmen by descent may be estimated at about 250,000 persons, Scots 120,000, foreigners 200,000, viz., Asiatics, Africans, and Americans together 45,000, Europeans 155,000 (Germans 60,000, French 30,000, Dutch 15,000, Poles 12,000, Italians 7,500, Swiss 5,000). The number of Jews is about 40,000. The special foreign district of London is that of Soho; another foreign district lies in the neighborhood of Ratcliff Highway, now St. George street. The lower-class Jews inhabit the neighborhood of Houndsditch and Aldgate. The Italian street musicians and vendors of ices form a small colony near Hatton Garden.

LONDON, the capital of Middlesex county, Ontario, Canada, is a thriving city with a population (1890) of 27,000. It is located on the river Thames, and is well supplied with railroads. The city is well built, and contains six banks, fine hotels and stores, several newspaper offices, hospitals, convents, and educational institutions, and a very large manufacturing interest. It is a port of entry and has a board of trade. The city is the center of an important agricultural region, and is a busy shipping-point. The population was 15,826 in 1871, and 37,981 in 1901; but the East, West, and South London suburbs—really part of the city, though not yet included within the municipal boundaries—have a population of upward of 10,000.

LONDONDERRY, a maritime county in the province of Ulster, Ireland, is bounded on the north by the Atlantic, on the west by Lough Foyle and Donegal, on the east by Antrim and Lough Neagh, and on the south by Tyrone. It has an irregular oval form, its greatest length being about fifty miles, and its greatest breadth about forty. The area comprises 513,388 acres, or about 816 square miles. The county consists chiefly of river valleys surrounded by elevated table-lands rising occasionally into mountains, while on the borders of the sea-coast the surface is generally level. The principal river is the Roe, which flows northward from the borders of Tyrone into Lough Foyle below Newtown-Limavady, and divides the county into two unequal parts. Pop. (1901), 144,329.

History and Antiquities.—At an early period the county was inhabited by the O'Cathans, or O'Catrans, who were tributary to the O'Nials or O'Neils. Toward the close of the reign of Elizabeth the county was seized with the purpose of checking the power of the O'Neils, when it received the name of Coleraine, having that town for its capital. In 1609, after the confiscation of the estates of the O'Neils, the citizens of London obtained possession of the towns of Londonderry and Coleraine and adjoining lands, sixty acres out of every 1,000 being assigned for church lands, and certain other portions to three native Irish gentlemen. The common council of London undertook to expend £20,000 on its reclamation, and elected a body of twenty-six for its management, who in 1613 were incorporated as the Irish Society, and retained possession of the towns of Londonderry and Coleraine, the remainder of the property being divided among twelve of the great livery companies of the city. Notwithstanding the expenditure of large sums by these companies in its management, their estates were afterward sequestered by James I., and in 1637 the charter of the Irish Society was canceled. Cromwell restored the society to its former position, and Charles II. at the Restoration granted it a new charter, and confirmed the companies in the possession

of their estates. In the insurrection of 1641 Money-more was seized by the Irish, and Magherafelt and Bellaghy, then called Vintner's Town, burned, as well as other towns and villages. The most remarkable ancient ruin is that of the Cyclopean fortress of the Giant's Sconce or Ring, situated in the pass between Drumbo and Largantea, the interior of which, 600 feet in diameter, is partly hollowed out of a knoll of basalt, by which it is inclosed on all sides except the northeast, where it is defended by a wall of great thickness, with access for only one person in a stooping posture. The most remarkable of the Druidical circles is that at Slacht Manus. There are a large number of artificial caves. The most ancient castle of Irish origin is that of Carrickreagh; and of the castles erected by the English those of Dungiven, Salterstown, and Muff are still in good preservation. The old abbey of Dungiven, founded in 1109, and standing on a rock about 200 feet above the river Roe, is a very picturesque ruin.

LONDONDERRY, or DERRY, a county of a city, parliamentary borough, and the chief town of the county of Londonderry, is situated on an eminence rising abruptly from the west side of the river Foyle to the height of about 20 feet, four miles from the junction of the river with Lough Foyle, and eighty miles north-northwest of Belfast. It is still surrounded by an ancient rampart about a mile in circumference and having seven gates, but the buildings now extend considerably beyond this boundary. The population of the city in 1901 was 39,873.

Derry, the original name of Londonderry, is derived from *Doire*, the "place of oaks." It owes its origin to the monastery founded by Columba in 546. From the ninth to the eleventh century the town was frequently in the possession of the Danes, and was often burned and devastated, but they were finally driven from it by Murtagh O'Brien about the beginning of the twelfth century. In 1311 it was granted by Edward II. to Richard de Burgo. After the Irish society of London obtained possession of it, it was in 1613 incorporated under the name of Londonderry. The fortifications, which were begun in 1600, were completed in 1618 at a cost of nearly £9,000. Its charter was confirmed in 1662 by Charles II. From April 18, 1690, the Protestants of the north defended themselves within its walls against James II. until the siege was raised in the following August. See the *History* by Hempton (1861).

LONDONDERRY, ROBERT STEWART, SECOND MARQUIS OF, better known by his courtesy title of Viscount Castlereagh, which he held until the last year of his life, the statesman who brought about the union with Ireland, who was foreign minister for ten eventful years, who represented England at the congress of Vienna, and who was the recognized leader of the aristocratic or reactionary party which owed its being to the excesses of the French Revolution, was born on June 18, 1769, and was thus one year older than his great rival, George Canning. He was educated at a school in Armagh, and proceeded in 1786 to St. John's College, Cambridge. He spent only a single year at the English university, and was on his grand tour through Europe when he was summoned home by his father, who had just been created Lord Londonderry in the peerage of Ireland, to stand for the county of Down as the candidate of the smaller landholders against the influence of the marquis of Downshire. He was successful, and the young Stewart entered the Irish parliament as one of the few really independent members who sat there, bound by no ties to a great lord, but the representative of three thousand freeholders of the richest county of the most educated province of Ireland. He joined the opposition, and eagerly pressed for

the extension of the franchise to the Roman Catholics; but the great events of the French Revolution soon showed their influence on his opinions, as on those of most landed proprietors. His thoughts on politics already clearly pointed toward the necessity of a union between England and Ireland, a necessity by this time obvious to all political thinkers and practical politicians. But for the time he held firmly to the popular side, voting for the removal of Catholic disabilities, and the right of Irishmen to trade with India. At last, however, Lord Camden came over to Ireland, in March, 1795, as lord-lieutenant, with Mr. Pelham as his secretary, on a mission to tell the Catholics and reformers that they must expect no further relief and no further reform. Lord Camden used his influence to obtain for his brother-in-law a viscountcy as Viscount Castlereagh in October, 1795, and in the following August an earldom as earl of Londonderry. In that same August, 1796, he made Robert Stewart, who, by his father's promotion, had become Viscount Castlereagh, keeper of his signet. During the rebellion of 1798, when Lord Camden resigned in panic, Castlereagh showed all the qualities of an energetic minister of police, and heartily cooperated with the wise measures of Lord Cornwallis, by which the rebellion was soon brought to an end. He was equally useful to Cornwallis in the second part of his mission to Ireland, namely, the union with England. The measure was to be carried; the means were bribery, whether in honors or in money. The Union carried (1800), then came the fulfillment of promises made to secure support or disarm opposition, and first in importance those of the Catholics. But the promises were not fulfilled, and the best part of the cabinet resigned. With his resignation ends the first epoch of Castlereagh's political life.

Castlereagh was sworn of the English privy council in December, 1799, and returned to the first united parliament for the county of Down. He had no intention of permanently losing office by his advocacy of the Catholic claims, and therefore, instead of going into violent opposition like Canning and others of the late administration, he supported the weak Addington ministry, and in June, 1802, was appointed president of the Board of Control. On Pitt's return to power in December, 1804, he kept Castlereagh in office, and in 1805 made him secretary of state, of war, and the colonies, as well as president of the Board of Control. He now prepared a great expedition of thirty thousand men, who were to land in Hanover and make a diversion in northern Germany in favor of the Russians and Austrians. The expedition was too late to be of any use.

When Pitt died, Castlereagh was prime mover in the attempt to make Lord Hawkesbury premier, and when that failed, sooner than give up all hope of place, he declared that he and his friends "looked to" Lord Grenville. Grenville, however, formed his ministry of "All the Talents" out of the sections which followed Fox, Windham, and Sidmouth. The opposition was led in the House of Commons by Castlereagh and Canning. Each rival despised the other. The rivals were not long in opposition, the new ministry resigning in 1807. The duke of Portland formed a new administration on strictly anti-Catholic principles, in which Castlereagh and Canning, both advocates of the Catholic claims, were secretaries of state, the former for war and the colonies, the latter for foreign affairs. The chief events connected with the war office during his tenure of office were the expeditions to Copenhagen, the Peninsula, and Walcheren. The Walcheren expedition went far utterly to ruin Castlereagh's reputation, and completed the difference between Canning and himself. The failure of the expedition brought about a crisis in

the cabinet. In April, 1809, Canning had sent in his resignation to the duke of Portland, declaring that he could no longer serve with Castlereagh, but the matter was put off from time to time, and at length Canning consented to wait till the Walcheren expedition was over. In September he insisted once for all that something must be done, and then for the first time Castlereagh heard that his dismissal had been determined on for some months.

After this both resigned, and remained out of office two years, but Castlereagh did not intend to remain so, and through the influence of his aunt, old Lady Hertford, with the prince regent, he was, after the refusal of Canning, offered the secretaryship of state for foreign affairs in March, 1812, in the room of Lord Wellesley. On Perceval's assassination in May, 1812, the leadership of the House of Commons was given to Castlereagh. The first ten years of Lord Liverpool's administration were the palmy days of the Tory aristocracy, and during them Lord Castlereagh was the guiding spirit of foreign policy in the cabinet, and the faithful interpreter of Lord Sidmouth's home policy in the House of Commons. When the allies entered France, Castlereagh himself left England to attend the congress of Chatillon. He remained with the armies of the allies, entered Paris with them and signed the preliminaries of peace. Great was the applause he received on his return from the people, and above all in the House of Commons. The prince regent made him a Knight of the Garter, an honor which had only been conferred on two commoners, Sir R. Walpole and Lord North, in the last 200 years, and when the allied sovereigns visited London they treated him with marked favor, so that it was no wonder that when he started to take his seat as British plenipotentiary at the congress of Vienna, he believed himself to be a great diplomatist. That he was mistaken in this was conclusively proved by that congress, where, as Von Gentz said, England could have done anything, and did nothing. Throughout he supported Metternich, partly because Metternich's nature had mastered him, but more because he had imbibed a blind distrust of Russia. When the return of Napoleon from Elba put an end to the quarrels which were nearly ending in a general war between Prussia and Russia on the one side and England, France, and Austria on the other, and united all parties against him, Castlereagh returned to England, and expressed his confidence in a speedy termination of the new struggle, which indeed was closed at Waterloo. He signed the second peace of Paris on behalf of England, and on his return his father was created marquis of Londonderry. From this time his career can be sketched very shortly. At home the grand harvest of 1815 was followed by very bad ones, and great discontent existed among both the agricultural and manufacturing classes. The government pursued the same tactics which had in 1793 united nearly all the upper classes in a fever of reaction; they established a secret committee which declared the existence of a wide-spread conspiracy, and it was often their spies who threw into the meetings of the discontented sufficient politics to make them look like conspiracies. The bad feeling existing came to a climax with the Peterloo massacre, and Lord Sidmouth introduced his Six Acts to check a network of conspiracies which mostly did not exist. Castlereagh had to introduce the Six Acts in the House of Commons, and as usual spoke of the people with the air of hauteur and contempt which made him so particularly obnoxious to them. His foreign policy during these years was chiefly inspired by a real desire to maintain the peace of Europe, which he believed was only to be preserved by the harmony of all the monarchs and their foreign ministers, and to preserve this harmony he was so loth to differ from them or

any subject that it was commonly believed among the people that he had signed the Holy Alliance. At the congress of Aix-la-Chapelle in 1818 it was for this reason that he recommended that France should be freed from the army of occupation. The death of George III. in January, 1820, made no difference to Castlereagh, who was greatly in the favor of the new king and who had no difficulty in supporting the Bill of Pains and Penalties against the queen. Scarcely was the excitement of the queen's trial and the king's coronation over, when Lord Londonderry, for he had succeeded to that title in this very year, accompanied the king to Hanover in October, 1821, to discuss the revolutions in Greece and Spain with Metternich. The interviews which then took place are fully described in Metternich's *Autobiography* (vol. iii. pp. 552-560), and exhibit clearly the paramount influence of Metternich over Lord Londonderry, whom he persuaded to take part in a congress at Verona in the following year. While he was making preparations to start, he became possessed by many strange delusions, which clearly indicated that his mind was unhinged by overwork, as it had been once before after the passing of the Union with Ireland. This soon became obvious to everyone; the king noticed it; and the duke of Wellington sent a physician down to Fooks Cray to see him. The doctor found him suffering from melancholia, and ordered his razors to be taken away, but in spite of all precautions he procured a pen-knife and committed suicide on August 12, 1822. His body was conveyed to London to be buried in Westminster Abbey, and just as it was being lowered into the grave a cry of exultant hatred arose from the people he had so despised.

LONG, GEORGE, an English scholar, was born at Poulton in Lancashire on November 4, 1800. He died after a long and painful illness on August 10, 1879.

LONG BRANCH, a fashionable seaside resort of the United States, in Ocean township, Monmouth county, N. J. The old village lies about a mile inland, but the watering-place proper is for the most part situated on the bluffs and plateau immediately above the beach. The bathing-grounds are excellent; there are fine drives along the beach in the vicinity; upward of 20,000 visitors can find accommodation in the hotels alone, of which there are no less than thirty-three; and there are besides hundreds of private residences occupied mainly by the wealthier classes from New York and Philadelphia. Since 1874 it can be reached directly from New York both by railway and by steamers. Long Branch has a corporation of seven commissioners. Its permanent population in 1880 was 3,833, in 1900, about 8,872.

LONGEVITY is a term that may be applied to express either the length or duration of life of any organism, or the prolongation of life to an advanced age. The information we possess as to the natural duration of life of the lower forms of plants and animals is very meager, and it can scarcely be asserted that in all there is a natural period of life.

Excluding the lower forms of plants, as to the duration of whose lives we know nothing, the higher plants may be classed, according to duration of life, as follows:—*Annuals*, or *semi-annuals*, which grow up in spring and die in autumn; *biennials*, which die at the end of the second year; and *perennials*, the duration of which may last from four to thousands of years. Succulent plants have a short life, lasting only one or two years; the formation of wood is necessary for prolonged vegetable existence. It has been pointed out that strongly scented plants have often a longer duration of life than those destitute of smell. Thus thyme, mint, hyssop, marjoram, sage, etc., can live for two years or

longer; while lettuce, wheat, oats, barley, live no more than a year. Trees of rapid growth, such as fir, birch, horse-chestnut, form soft wood, and have a comparatively short life; while hardwood trees, such as the oak, grow slowly and live long. It is not, however, an invariable rule that trees yielding hard wood live longest. The beech, cypress, juniper, walnut, and pear all form hard wood, but they do not live so long as the lime, which forms a softer wood. Trees which are long in producing leaves and fruit, and which also retain these for a long time, live longer than those in which these changes occur quickly. Fruit-bearing trees, producing a sour, harsh fruit in the wild state, have longer lives than those bearing sweet fruits in the cultivated state. By skillful pruning, or lopping off the branches and buds, the term of life of even short-lived plants may be lengthened.

In the animal kingdom there is great variety as regards the duration of life, but no accurate data have yet been collected. Certain *Infusoria* have been watched during the whole period of their existence, which has not lasted more than forty-eight hours; on the other hand, *Actinia*, or sea anemones, may live to a great age, as shown by the case of a specimen of *Actinia mesembryanthemum*, still alive in Edinburgh, which belonged to Sir John Dalyell, and which must be at least about seventy years of age. It is highly probable that cold-blooded animals, such as fishes, frogs, toads, in which tissue-changes go on with extreme slowness, especially during a period of muscular inactivity, may live for many years. In the imperial fish ponds of ancient Rome lampreys were said to have attained their sixtieth year; pike and carp have been ascertained to live a hundred and fifty years; tortoises have reached the age of one hundred years; and it is alleged by natives of India that the crocodile may live for at least a hundred years, and that there seems to be no limit to its time of growth. Many birds have a long period of life. Eagles and crows have been known to live a hundred years, and parrots have been kept in confinement for sixty years. Peacocks attain an age of twenty years; barn-yard fowls live for a much shorter period, from six to twelve years. Small birds seem to have shorter lives than large ones. Blackbirds, goldfinches, and canaries have been known to live for twenty years; but many of the smaller birds attain an age of only five or six years.

Among mammals, the elephant is supposed to attain the greatest age, reaching above a hundred years; the camel generally lives to fifty years, and may live to eighty; the horse does not live more than forty years; the deer, thirty years; the ox, fifteen to twenty years; sheep, goats, foxes, hares, rabbits, from seven to ten years; and dogs and pigs from fifteen to twenty years. Certain general statements may be made, which do not deserve to be termed laws, but which briefly express relations that undoubtedly exist in many cases between the degree of longevity enjoyed by any species of animal and the conditions of its existence.

A relation can often be traced between the duration of life and the time of the development of the animal *in utero*. To this statement there are many exceptions, however.

It would appear that the sooner a being attains maturity the sooner it propagates, and the shorter will be the duration of its life. The reproductive act may be regarded as the culminating act of the organism, requiring the highest degree of vitality, and involving the largest expenditure of energy. This act will therefore be performed when the organism has reached maturity in some cases the animal reaches maturity late, in other cases early; but in all the epoch of maturity may be taken as about a fifth part of the whole duration of life.

Thus the elephant and the human being do not reach maturity till say the twentieth year, and the period of longevity is about a hundred years; the horse, ass, and bull are mature in the third or fourth year, and live from fifteen to twenty years; sheep come to maturity in the second year, and live from eight to ten years; while rabbits and guinea pigs are mature within one year, and live only from four to five years. Here again there are exceptions, as, for example, the cat is mature before the end of the first year, and still it may live to the age of twenty years. Much information is still required on these points before a law can be formulated.

The question of longevity, however, probably presents the greatest interest in its relation to man. It is still a popular belief that the earliest inhabitants of the world possessed an incredible strength, were of an enormous size, and lived to a very great age; and the ages of the patriarchs, before the flood, are often taken literally, although the conditions making such long lives possible are at variance with those of human existence at the present day. In ancient history there are instances given of heroes who attained the age of several hundred years, but these must be regarded as mythical.

The following are a few instances of extreme longevity which have been placed on record: Margaret Patten, 137; the countess of Desmond, 145; Thomas Parr, 152; Thomas Damme, 154; John Rovin, 172; and Peter Torton, 185. There can be little doubt that the ages of these persons have been much exaggerated. They lived at a time when no accurate chronological records were kept, and when it was the habit to fix the dates of occurrences by comparing them in the memory with other events believed to have happened about the same time.

The average duration of life in Europe is about thirty-four years. It oscillates between 28.18 years (Prussia) and 39.8 years (Schleswig-Holstein, Lauenburg). In Naples it is quoted at 31.65 years. This falls far short of the possible longevity, a circumstance chiefly to be accounted for by the great mortality in the early years of life. According to De Quatrefages, the duration of life is almost universally the same among the best known peoples. Laplanders live to a great age, men of from seventy to ninety years of age being common among them. The American Indians have apparently as long a life, on the average, as the white men living in the same locality. It would appear to be the same in the case of the negro. Prichard quotes from an official document of the State of New Jersey, showing that the census gave one negro centenarian in the 1,000, but only one white centenarian in 150,000; on the other hand, the negro of the Senegal ages early, and does not live long. In his native place he is exposed to unhealthy influences, which tell upon him, although he resists the bad effects of these longer and better than the white man; but when he is transplanted to America he enjoys a longer life.

The manner of life and the nature of the occupation, apart from hereditary and special causes, have a most important influence on the duration of life. Few emperors or kings have attained the age of eighty; and, of more than three hundred popes, only six have exceeded the age of eighty. It would seem that brain-work is not unfavorable to longevity. It is almost proverbial that statesmen and judges often reach an advanced age. Many men famous in literature and science have lived to an old age.

What are the physiological conditions in the human being that determine longevity? In the first place, there is the influence of heredity. Certain peculiarities of tissue are transmitted from parent to offspring that

determine whether or not the tissue will remain for a lengthened period of time in a normal condition, or whether it will quickly yield to external influences and take on an abnormal action. As the life of the body is really the sum of the lives of its constituent parts, or in other words, of the cellular elements composing it, it is evident that anything affecting the healthy action of these elements will affect the life of the body as a whole. In some individuals the tissues have what may be termed an hereditary taint, by which is meant a want of stability, so that they pass readily from a normal into an abnormal condition; and this is unfavorable to longevity.

In the next place, even healthy tissues capable of resisting ordinary influences may be unable to resist long-continued unfavorable conditions. In course of time slow changes begin in the tissue; these in turn affect the organ in which the tissue exists, and the organ, by improperly performing its functions, injures the organism. Thus it is that habitually breathing an impure atmosphere, eating improper food, saturating the body with drugs or with alcohol, over-exerting the nervous system by excitement or prolonged brain-work or worry, and sexual excesses debilitate the body by working slow but sure changes in the tissues which will inevitably tell upon the longevity of the individual.

But even in the most favorable conditions there seems to be a limitation to the healthy action of tissues, and old age comes on. Whether this is or is not the result of long hereditary transmission it is not of much practical importance to ask, as it is a state of things all flesh is heir to. But if it be hereditary, as is highly probable, there is the satisfaction of knowing that hereditary states can be slowly influenced by individuals living in the best possible conditions and transmitting the influences of good moral and physical hygiene. If bad hereditary qualities are transmitted, good qualities have even a better chance of being perpetuated, as they favor the individual in the struggle for existence. Thus a race which has a low degree of longevity may acquire, by persistent attempts to live in the best conditions, a long average duration of life. This is also true, though to a less extent, of an individual life.

LONGFORD, an inland county of Leinster, Ireland, is bounded on the northwest by Leitrim, northeast by Cavan, east by Westmeath, south by Westmeath and Meath, and west by Lough Ree and Roscommon. With the exception of Carlow, Louth, and Dublin, it is the smallest county in Ireland, its greatest length being about twenty-eight miles, its greatest breadth about twenty, and the total area comprising 269,409 acres, or about 421 square miles.

The total number of horses in 1881 was 6,856, of which 4,253 were used for agricultural purposes; of cattle, 51,547, of which 16,212 were milch cows; of sheep, 24,140; of pigs, 17,900; and of poultry, 232,324. There were 3,066 asses and 670 mules. According to the latest return, the land was divided among 436 proprietors possessing 256,668 acres, with an annual ratable value of £151,739, the average ratable value per acre being 11s. 10d. The average size was 588 acres, and 14 per cent. possessed less than one acre. The largest owners were Colonel King-Harman, 28,779 acres; earl of Granard, 14,978; Lord Anahly, 12,160; George Maconchy, 10,319.

Manufactures are confined almost entirely to coarse woolen and linen cloth. One branch of the Midland Great Western Railway skirts the eastern boundary of the county, and another passes through its center to Longford. The county includes six baronies, with twenty-six parishes and 891 townlands. It is in the northwest circuit. Assizes are held at Longford, and quarter sessions at Bal

lymahon, Granard, and Longford. There is one poor-law union wholly within the county, with portions of other two. It is in the Dublin military district and Birr sub-district. There are barracks for infantry and cavalry at Longford. The county returns two members to parliament. The only town of any importance is the county town, Longford. From 25,142 in 1760, the population of the county gradually increased till in 1841 it was 115,491, but since then it has diminished to 82,348 in 1851, 64,501 in 1871, and 46,581 in 1901, of whom 23,765 were males, and 22,816 females. The early Celtic name of Longford was Analé or Annaly, and it was a principality of the O'Farrells. Along with the province of Meath, in which it was then included, it was granted by Henry II. to Hugh de Lacy, who planted in it an English colony. On the division of Meath into two counties in 1543, Annaly was included in West Meath, but in the 11th of Elizabeth it was made shire ground under the name of Longford, and included in the province of Connaught, from which it was transferred to Leinster in the 27th of the same reign.

The principal antiquarian ruin is the Danish rath called the Moat of Granard, at the end of the main street of the town, and occupying a position 593 feet above sea-level. There are monastic remains at Ardagh, Longford, Moydow, Clone, Derg, Drimchei, and Killinmore, as well as on several of the islands of Lough Ree. The principal old castles are those of Rathcline near Lanesborough, and Ballymahon, Burnacor, and Castlecor on the Inny. The principal modern seats are those of Carrickglass on the Camlin, and Castle Forbes, the seat of the earl of Granard. Oliver Goldsmith was born at Pallas, a village near Ballymahon, in this county.

LONGFORD, the chief town of the above county, is situated on the river Camlin, and on a branch of the Midland Great Western Railway, seventy-five miles west-northwest of Dublin.

LONGINUS, a philosophical critic of great eminence, and one of the brightest spirits of antiquity, uniting Greek subtlety with Roman fervor, flourished in the third century, and is known to have perished under sentence of the emperor Aurelian in 273 A.D. He forms one of the last brilliant cluster of pagan literati; and Porphyry, round whom it centered, was the pupil of Longinus.

The most conspicuous event of his life was also the most tragic in its consequences. He became secretary to Zenobia, the widowed queen of Palmyra, who acquired from him a knowledge of Greek, and made him her chief counselor in state affairs. In this capacity he favored the policy by which she aimed at independence of the Roman empire, encouraged, doubtless, to do so, by the recent fate of Valerian, and by the feebleness of the tenure by which Rome held the Syrian provinces. Aurelian, however, crushed the pretension, and while Zenobia lost her power, and was led captive to Rome, Longinus paid the forfeit of his life. According to Zosimus, Zenobia sought to exculpate herself with Aurelian by laying the whole blame on her adviser. He died bravely, not seeking to escape his fate by suicide as a Stoic might have done, but following the example of Socrates and the precept of Plato, to whose philosophy he adhered.

LONG ISLAND, an island with an area of 1,682 square miles, lying off the coast of the United States, and forming part of the State of New York. While the length from east to west is about 120 miles, the width nowhere exceeds twenty-four miles, and in some places falls to twelve or fifteen. The western end is separated from the city and State of New York by the East river, which is nowhere more than three-quarters

of a mile in breadth, and has been spanned by a great suspension bridge; but between the main body of the island and the mainland (Connecticut, Rhode Island) lies Long Island Sound, widening out to a breadth of twenty miles. The sound, however, is comparatively shallow, the depth in the eastern and seaward portion being usually under 200 feet, while in the portion west of Connecticut river it is nowhere more than 170 feet, and in general only 75 to 100 feet. Geologically the island is very interesting, consisting, as it does for the most part, of an immense morainal deposit of glacial drift.

Of the numerous lakelets scattered throughout Long Island it is enough to mention Ronkonkoma, near Lakeland, the waters of which are said to decrease and increase in regular periods of four years. Much of the surface of the country is still covered with wood—oak, hickory, and chestnut growing freely on the unmodified drift, and pine forests extending for about fifty miles through the sandy plains. A good rich loam abounds in the northern districts, and the lighter soils of the south are easily rendered productive. Market gardening especially is carried on with success. The climate is comparatively mild. Toward its western end more especially, the northern coast of Long Island presents a number of important bays—Glen Cove, Oyster Bay, Huntington Bay, Smithtown Bay, etc.; the western extremity is deeply bifurcated by a very irregular inlet, broken up by various islands into Gardiner's Bay, Little Peconic, and Great Peconic; and along a large part of the southern coast stretches a remarkable series of lagoons, formed by a line of dunes varying in breadth from one-quarter to one mile, and connected at various points with the ocean. These last—of which the most important is Great South Bay, forty miles long by about five or six miles wide—are of great service to the island, and an Act has been passed to increase their utility by connecting them by canals. Coney Island and Rockaway Beach, the most frequented of the many seaside resorts in the Island, lie near the southwestern extremity. As regards both birds and fishes, Long Island seems a kind of meeting place between the arctic and equatorial species. In winter, for instance, it is visited by the eider-duck, the little white goose, the great cormorant, and the auk, in summer by the turkey buzzard, the swallow-tailed kite, and the fork-tailed flycatcher. A few deer are still to be found; and various tracts of country and islands in the great bays are stocked with game and fish by sportsmen's clubs. The east portion of the island is one of the chief seats of the menhaden fisheries, and the oyster beds of both the north and the south coast are of great value. Those of the Great South Bay (furnishing, among others, the famous "blue points") alone give employment in the season to 1,500 fishermen.

Administratively Long Island consists of King's county (72 square miles), Queen's county (410), and Suffolk (1,200), which in 1880 had the following population:— Pop. (1900) embraced in Greater New York.

	Total.	Male.	Female.	Native.	Foreign.	White.	Colored.
King's	599,549	289,289	310,260	411,295	188,254	590,278	9,271
Queen's	90,547	45,760	44,787	68,556	21,991	86,707	3,840
Suffolk	53,926	26,759	27,167	48,319	5,607	51,473	2,458

Of the thirteen or fourteen Indian tribes living in the island at the time of its discovery, the only remnants are about fifty Shincocks and Montauks.

Besides Brooklyn, which has 1,166,582 inhabitants,

King's county contains Flatbush town, 7,634; Flatlands town, 3,127; Gravesend town (including Coney Island village), 3,676; New Lots town, 13,681; and New Utrecht town, 4,742. In Queen's county are Flushing town, 10,868; Hempstead town (including East Rockaway, Garden City, and sixteen other villages), 18,160; Jamaica town, 10,089; Long Island City, 30,506; Newtown town, 9,798; North Hempstead town, 7,562; and Oyster Bay town, 11,923. In Suffolk there are no cities, and none of the villages have 500 inhabitants. The "towns" are Babylon, Brookhaven, East Hampton, Huntington, Islip, Riverhead, Shelter Island, Smithtown, Southampton, and Southold. Garden City was built by A. T. Stewart as a model suburban settlement, and contains a fine cathedral. Hicksville is associated with the memory of Elias Hicks, the Quaker missionary. Sag Harbor was formerly a great whaling station, and still maintains a good coasting trade. Five miles from Flushing is Creedmoor rifle range, the finest in the United States. On Gardiner's Island the pirate Kidd concealed the treasures partly recovered by the governor of Massachusetts in 1699.

Long Island was so called by its Dutch discoverers in 1609, and the name Nassau, bestowed in 1693 by the colonial legislature, never found popular acceptance. Breucklen (Brooklyn), Amersfoort (Flatlands), Vissingen (Flushing), RUSDORF (Jamaica), and New Utrecht were founded by the Dutch between 1630 and 1654; and between 1640 and 1665 the English from the New England colonies established Southold, Southampton, Easthampton, Hempstead, Huntington, Oyster Bay, Smithtown, Islip, etc. Though the charter granted by James I., in 1620, expressly excluded territory actually possessed or inhabited by any other Christian prince or state, the grantees, in 1635, conveyed to the earl of Stirling among other lands the island of Matoworks or Long Island. A treaty concluded between Dutch and English at Hartford (Connecticut) in 1650 surrendered to England all the land south of Oyster Bay; but, though it was ratified by the states-general of Holland in 1656, no action was taken by the English Government. Long Island was included in the territory assigned to the duke of York in 1663-64, and in 1664 an English squadron conquered the Dutch in time of peace, and set up a government in the duke's name. When the Dutch governor, who had recovered New York in 1673, issued a proclamation requiring the submission of the Long Island towns, they all obeyed except the three most eastern; but the treaty of Westminster, in 1674, left Long Island to the English, and it became a regular colony of the crown. In the beginning of the war of American independence, Long Island naturally played a prominent part. The efforts made by Washington to defend it were frustrated by the British under Cornwallis in 1776, and it remained in their hands till the close of the contest.

LONG ISLAND CITY, a city of the United States, the capital of Queen's county, N. Y., situated on the west coast of Long Island, and separated from New York by the East River and from Brooklyn by the Newtown Creek. The area, which includes what were the post-villages of Astoria, Newtown, and Ravenswood, measures three miles from east to west, and five miles from north to south, and the general plan of the place is constructed on a spacious scale. The river frontage extends to about ten miles. Hunter's Point, as the southwest portion is called, contains the terminal depots of several railway lines, extensive warehouses for the storage of petroleum, and a variety of industrial establishments—such as granite-works, chemical works and engine-works. In the Astoria district there are factories

for pianos, carriages, and carpets. **Long Island City** dates from 1870; in 1874 its population was about 16,000, and in 1890, 30,506. See **NEW YORK CITY**.

LONGITUDE. See **GEOGRAPHY (MATHEMATICAL)** and **TIME**.

LONGOMONTANUS, or **LONGBERG**, **CHRISTIAN**, a Danish astronomer, was born at Longberg, a village of Jutland, in Denmark, on October 4, 1562. He died in 1647.

LONGUEVILLE, **ANNE GENEVIÈVE, DUCHESSE DE**, who played the greatest part in the troubles of the Fronde, and whose name has come down to posterity as the brilliant intriguer in politics in her early and the pious protectress of the nuns of Port Royal in her later years, was the only daughter of Henri de Bourbon, Prince de Condé, and his wife, Charlotte Marguerite de Montmorency, and the only sister of Louis, the great Condé. She was born on August 28, 1619, in the prison of Vincennes, into which her father had been thrown for opposition to Marshal D'Ancre, the favorite of Marie de' Medici, who was then regent in the minority of Louis XIII. It was first proposed to marry her to the young Prince de Joinville, and thus unite the Guises and Condés, but he died in 1639, and her parents could only find for her husband the Duc de Longueville, a prince of the blood, indeed, and governor of Normandy, but a widower, and twice her age. The marriage could not be a happy one, but the young duchess long remained faithful to him, and bore him four children. After Richelieu's death her father became chief of the council of regency during the minority of Louis XIV., her brother Louis won the great victory of Rocroy in 1643 (see **CONDÉ**), and the duchess became of political importance. In 1647 she accompanied her husband to Münster, where he was sent by Mazarin as chief envoy, and where she charmed the German diplomatists who were making the treaty of Westphalia, and was addressed as the "goddess of peace and concord." On her return she fell in love with the Duc de la Rochefoucauld, the author of the *Maxims*, who made use of her love to obtain influence over her brother, and thus win titles and honors for himself. She was the guiding spirit of the first Fronde, when she brought over Armand, Prince de Conti, her second brother, and her husband to the malcontents, but she failed to attract Condé himself, whose loyalty to the court overthrew the first Fronde. However, La Rochefoucauld won the titles he desired. The second Fronde was again her work, owing to her lover's disgust at losing his new honors, and in it she played the most prominent part in attracting to the rebels first Condé and later Turenne (see **CONDÉ**). In the last year of the war she was accompanied into Guienne by the young and handsome Duc de Nemours, her intimacy with whom gave La Rochefoucauld an excuse for abandoning her, and who himself immediately returned to his old mistress, the Duchesse de Chevreuse. Thus abandoned, and in disgrace at court, the duchess betook herself to religion. She accompanied her husband to his government at Rouen, and devoted herself to good works. She took for her director M. Singlin, so famous in the history of Port Royal, and from that time began her new religious life. Till 1663 she chiefly lived in Normandy, when her husband died, and she came to Paris. There she became more and more Jansenist in opinion, and her piety and the remembrance of her influence during the disastrous days of the Fronde, and, above all, the tender love her brother, the great Condé, bore her, made her a conspicuous figure. The king pardoned her, and in every way showed the respect he had for her. She became the great protectress of the Jansenists; it was in her house that Arnould, Nicole, and De Lane were protected; and

to her influence must be in great part attributed the release of De Sacy from the Bastille, the introduction of Pomponne into the ministry and of Arnauld to the king. On her death, in 1679, she was buried with great splendor by her brother Condé, and her heart, as she had directed, was sent to the nuns of that Port Royal des Champs which she had so greatly protected and defended.

LONGUS, the Greek romancer. Nothing is known of the life of the author of *Daphnis and Chloe*, and it is only inferred from some apparent imitations of the *Æthiopica* of Heliodorus that he wrote after the time of Theodosius. He may therefore be placed in the fifth century. His position in literature is interesting and not unimportant: he represents the romantic spirit of expiring classicism, the yearning of a highly artificial society for primitive simplicity, and the endeavor to create a corresponding ideal.

LONS-LE-SAULNIER, capital of the department of Jura, France, is situated at a distance of 275 miles by rail from Paris, on the Vallière, a small tributary of the Saône, about 820 feet above the sea-level, at the point where the Besançon, Lyons, and Châlon-sur-Saône railways converge. The principal industry of the place is the manufacture of sparkling wines, the Étoile growth being the best for this purpose. About a mile to the west of the town are the salt-mines of Montmorot, employing 150 workmen; the bed of rock salt, which lies at a depth of 400 feet, and is nearly 100 feet thick, yields about 9,500 tons of pure salt yearly, 885 tons of sulphate of soda, and 300 tons of chloride of potassium. The population is 11,371.

LOO (formerly called LANTERLOO), a round game of cards. Loo may be played by any number of persons; from five to seven makes the best game. "Three-card loo" is the game usually played. A pack of fifty-two cards is required. The players being seated, the pack is shuffled and a card dealt face upward to each. The player to whom a knave falls has the first deal, the player to his left deals next, and so on in rotation. Each player is entitled to a deal, i.e., the game should not be abandoned till it returns to the original dealer; but, if there is a loo in the last deal of a round, the game continues till there is a hand without a loo. The pack is cut to the dealer, who deals three cards to each player and an extra hand called *miss*. The dealer turns up the top of the undealt cards for trumps. The dealer is sometimes permitted to deal the cards in any order he pleases; but the best rule is to require that the cards be dealt out one at a time in rotation, as at whist. During the deal each player contributes to the *pool* a sum previously agreed upon, the dealer contributing double. The players are bound to put in the stake before the deal is completed; sometimes a penalty is enforced for neglect. The deal being completed and the pool formed, each player in rotation, beginning from the dealer's left, looks at his cards, and declares whether he will play, resign, or take *miss*. If the former, he says "I play." If he takes *miss* he places his cards face downward in the middle of the table, and takes up the extra hand. If he resigns, he similarly places his cards face downward in the middle of the table. If *miss* is taken, the subsequent players only have the option of playing or resigning. A player who takes *miss* must play. Those who have declared to play, and the one—if there is one—who has taken *miss*, then play one card each in rotation, beginning from the dealer's left, the cards thus played constituting a *trick*. The trick is won by the highest card of the suit led or, if trumped, by the highest trump, the cards ranking as at whist. The winner of the trick leads to the next, and so on, until the hand is played out. The cards

remain face upward in front of the persons playing them.

LOOCHOO. See LEW-CHEW ISLANDS.

LOOM. See WEAVING.

LOOM, or LOON, a name applied to water-birds of three distinct families, all remarkable for their clumsy gait on land. The first of them is the *Colymbidae*, to which the term DIVER (*q.v.*) is nowadays usually restricted in books; the second the *Podicipedidae*, or Grebes; and the third the *Alcidae*. The form Loon is most commonly used both in the British Islands and in North America for all the species of the genus *Colymbus*, or *Eudytes* according to some ornithologists, frequently with the prefix Sprat, indicating the kind of fish on which they are supposed to prey; though it is the local name of the Great Crested Grebe (*Prodipterus cristatus*) wherever that bird is sufficiently well known to have one; and it was formerly given to the Little Grebe or Dabchick as well. The other form Loom seems more confined in its application to the north, and is said to be the proper name in Shetland of *Colymbus septentrionalis*; but it has come into common use among Arctic seamen as the name of the species of Guillemot (*Alca arctica bruenichii*) which in thousands throngs the cliffs of far northern lands, from whose (hence called) "loomeries" they obtain a considerable stock of wholesome food.

LOPE DE VEGA. See VEGA CARPIO.

LOPEZ, CARLOS ANTONIO, a Paraguayan ruler, born at Asuncion, November 4, 1799, was educated in the ecclesiastical seminary of that city, and by his ability attracted the hostility of the dictator, Francia, in consequence of which he was forced to keep in hiding several years. He acquired, however, by study, so unusual a knowledge of law and governmental affairs that, on Francia's death in 1840, he soon obtained an almost undisputed control of the Paraguayan state, which he maintained uninterruptedly until his own death in 1862.

LOPEZ, FRANCISCO SOLANO, eldest son of Carlos Antonio Lopez above noticed, was born near Asuncion, Paraguay, July 24, 1826. During his boyhood his father was in hiding, and in consequence his education was wholly neglected. Soon after his father's accession to the presidency, Francisco, then in his nineteenth year, was made commander-in-chief of the Paraguayan army, during the spasmodic hostilities then prevailing with the Argentine Republic. After receiving successively the highest offices of the state, he was sent, in 1853, as minister to England, France, and Italy, to ratify formally treaties made with these powers the previous year. He spent a year and a half in Europe, and succeeded in purchasing large quantities of arms and military supplies, together with several steamers, and organized a project for building a railroad and establishing a French colony in Paraguay. He also formed the acquaintance of Madame Lynch, an Irish adventuress, who became his mistress, and strongly influenced his later ambitious schemes. Returning to Paraguay, he became, in 1855, minister of war, and on his father's death, in 1862, at once assumed the reins of government as vice-president, in accordance with a provision of his father's will, and called a congress by which he was chosen president for ten years. He had long cherished ambitious designs, and now set himself to enlarge the army, and purchase in Europe large quantities of military stores. In 1864 he began open aggression on Brazil by demanding, in his self-styled capacity of "protector of the equilibrium of the La Plata," that Brazil should abandon her armed interference in a revolutionary struggle then in progress in Uruguay. No attention being paid to his demand, he treacherously seized a Brazilian merchant steamer in the harbor of Asuncion, and threw into prison the Brazilian governor of the province of Matto Grosso, who was on

board. In the following month (December, 1864,) he dispatched a force to invade Matto Grosso, which seized and sacked its capital Cuyabá, and took possession of the province and its diamond mines. Lopez next sought to send an army to the relief of the Uruguayan president Aguirre against the revolutionary aspirant Flores, who was supported by Brazilian troops. The refusal of the Argentine president, Mitre, to allow this force to cross the intervening province of Corrientes, was seized upon by Lopez as an occasion for war with the Argentine Republic.

A congress, hastily summoned and composed of his own nominees, bestowed upon Lopez the title of marshal, with extraordinary war powers, and on April 13, 1865, he declared war, at the same time seizing two Argentine war-vessels in the bay of Corrientes, and on the next day occupied the town of Corrientes, instituted a provisional government of his Argentine partisans, and summarily announced the annexation to Paraguay of the provinces of Corrientes and Entre Rios. Meantime the party of Flores had been successful in Uruguay, and that state on April 18th united with the Argentine Republic in a declaration of war on Paraguay, the news of the treacherous proceedings of Lopez having then but just reached Buenos Ayres. On May 1st Brazil joined these two states in a secret alliance, which stipulated that they should unitedly prosecute the war "until the existing government of Paraguay should be overthrown," and "until no arms or elements of war should be left to it." This agreement was literally carried out.

The war which ensued, lasting until April 1, 1870, was on the largest scale of any that South America had experienced, and was carried on with great stubbornness and with alternating fortunes, though with a steadily increasing tide of disasters to Lopez (see PARAGUAY). In 1868, when the allies were pressing him hard before the various strongholds still remaining to him in Paraguay, his mind, naturally suspicious and revengeful, led him to conceive that a conspiracy had been formed against his life in his own capital and by his chief adherents. His bloodthirsty rage knew no bounds. In a short time several hundred of the chief Paraguayan citizens were seized and executed by his order, including his brothers and his brothers-in-law, cabinet ministers, judges, prefects, military officers of the highest grade, the bishops and priests, and nine-tenths of the civil officers, together with more than two hundred foreigners, among them several members of the diplomatic legations.

Lopez was at last driven with a mere handful of troops to the northern frontier of Paraguay, where on April 1, 1870, he was surprised by a Brazilian force and killed as he was endeavoring to escape by swimming the river Aquidaban.

LORCA, a town of Spain, in the province of Murcia, on the right side of the Sangonera (here called the Guadalentin), by which it is separated from the suburb or quarter of San Cristobal. It is situated about thirty-eight miles west from Cartagena, and thirty-seven southwest from Murcia, at the foot of the Sierra del Caño. The population of the municipality (1898) was 59,624.

LORENZO MARQUES, or LOURENÇO MARQUES, the chief place, and indeed the only European settlement, in the district of its own name in the Portuguese province of Mozambique in southeastern Africa, is situated on Delagoa Bay, at the mouth of the Lorenzo Marques or English River. In 1900 official statistics returned the white population of the town as 5,130 (1,500 natives) (the area of the settlement is estimated at 210,000 square miles), and the natives as from 50,000 to 80,000.

LORETO, a city in the province and circundario of

Ancona, Italy, is situated some fifteen miles by rail southwest from Ancona on the Ancona-Foggia railway, sixteen miles northeast from Macerata, and three from the sea. The city itself consists of little more than one long, narrow street, lined with booths for the sale of rosaries, medals, crucifixes, and similar objects, the manufacture of which is the sole industry of the place. The population in 1871 was only 1,241; but, when the suburbs Montereale, Porta Marina, and Casette are included, the population is given as 4,755, that of the commune being 8,083.

The legend of the Holy House by which Loreto became what has been not inappropriately called the Christian Mecca, seems to have sprung up, how is not exactly known, at the close of the crusading period. According to this narrative the house at Nazareth in which Mary had been born and brought up, had received the annunciation, and had lived during the childhood of Jesus and after His ascension, was converted into a church by the apostles, and worship continued to be held in it until the fall of the kingdom of Jerusalem. Threatened with destruction by the Turks, it was carried by angels through the air and deposited (1291) in the first instance on a hill at Tersato in Dalmatia (some miles inland from Zengg), where an appearance of the Virgin and numerous miraculous cures attested its sacredness, which was confirmed by investigations made at Nazareth by messengers from the governor of Dalmatia. In 1294 the angels carried it across the Adriatic to a wood near Recanti; from this wood (lauretum), or from the name of its proprietress (Laureta), the chapel derived the name which it still retains ("sacellum gloriosæ Virginis in Laureto"). From this spot it was afterward (1295) removed to the present hill, one other slight adjustment being required to fix it in its actual site. Bulls in favor of the shrine at Loreto were issued by Sixtus IV. in 1491 and by Julius II. in 1507, the last alluding to the translation of the house with some caution ("ut pie credatur et fama est"). The recognition of the sanctuary by subsequent pontiffs has already been alluded to. In the end of the seventeenth century Innocent XII. appointed a "missa cum officio proprio" for the feast of the Translation of the Holy House, and the Festum Translationis Almæ Domus Lauretanæ B. M. V. is still enjoined in the Spanish Breviary as a "duplex majus" (December 10th). In the sixth lesson it is stated that "the house in which the Virgin was born, having been consecrated to the divine mysteries, was by the ministry of angels removed from the power of the infidels first to Dalmatia and afterward to the Lauretan field during the pontificate of Celestine V. That it is the identical house in which the Word was made flesh and dwelt among men is attested by papal documents, by the veneration of all the world, by continued miracles, and by the grace of heavenly blessings."

LORIENT, capital of an arrondissement in the department of Morbihan, and of one of the five maritime prefectures of France, a military port and fortified place, stands on the right bank of the Scorff, at its confluence with the Blavet, on the railway line from Nantes to Brest, at a distance of 117 miles from the former and 111 from the latter. Population (1901), 44,082.

LORRAINE (LOTHARINGIA, LOTHRINGEN) is geographically the extensive Austrasian portion of the realm allotted by the partition treaty of Verdun in August, 843, to the emperor Lothair I., and inherited by his second son, King Lothair II., 855-869, from whose days the name *Regnum Lotharii* first arose. This borderland between the realms of the Eastern and Western Franks in its original extent took in most of the Frisian lowlands between the mouths of the Rhine and the Ems,

and a strip of the right shore of the Rhine to within a few miles of Bonn. In the neighborhood of Bingen it receded from the left shore of the river so as to exclude the dioceses of Worms and Spire, but to admit a certain connection with Alsace.

Upper Lorraine, a hilly table-land, is bordered on the east by the ridge of the Vosges, on the north by the Ardennes, and on the south by the table-land of the Langres. Toward the west the open country stretches on into Champagne. The Meuse and the Moselle, the latter with its tributaries, Meurthe and Saar, run through it from southeast to northwest, in a direction parallel to the ridge of the Argennes. The empire, separating Germany from France, fell almost instantly to pieces, when Charles the Bold lost his conquests and his life in the battle of Nancy, January 4, 1477. After this the duchy tottered on, merging evermore into the stream of French history, though its bishops were princes of the empire and resided in imperial cities. In 1525 the country was invaded by German insurgents, and Lutheranism began to spread in the towns. When Maurice, elector of Saxony, and the German princes rose against the emperor (1552), they sold the three bishoprics and the cities of Toul, Metz, and Verdun, as well as Cambrai, to King Henry II., and hailed him as imperial vicar and *vindex libertatis Germaniæ*. In vain did Charles V. lay siege to Metz for nearly three months; the town, already entirely French, was successfully defended by the duke of Guise. German heresy also lost its hold in these territories owing to the Catholic influence of the house of Guise, which ruled the court of France during an eventful period.

For more than a century all Lorraine and Alsace up to the Rhine were French. When in the recent Franco-German war both Strasburg and Metz were taken by the German troops after a gallant defense, the French had to submit in the peace of Frankfort, May 10, 1871, to the political and strategical decisions of the conquerors. Old German territory, all Alsace, and a portion of Lorraine, the upper valley of the Saar, the strong fortresses of Diedenhofen (Thionville) and Metz on the Moselle, with the surrounding districts, viz., the greater part of the Moselle and the Meurthe departments, where here and there German is still the language of the inhabitants, were the spoils of victory. They are now united and administered in all civil and military matters as an imperial province of the new German empire.

LORY, a word of Malayan origin signifying Parrot, in general use with but slight variation of form in many European languages, is the name of certain birds of the order *Psittaci*, mostly from the Moluccas and New Guinea, which are remarkable for their bright scarlet or crimson coloring, though also, and perhaps subsequently, applied to some others in which the plumage is chiefly green.

LOS ANGELES, the capital of Los Angeles county, Cal., is situated in the lowland between the Sierra Madre and the Pacific, about seventeen miles from the coast, on the west bank of a stream of its own name. It lies 483 miles by rail south-southeast of San Francisco on the Southern Pacific Railroad, and is connected by branch lines with Wilmington, Santa Monica (both on the coast), and Santa Ana. As the center of a fine orange and grape growing country, and a resort for invalids, Los Angeles is a place of importance; and since the opening of the railways it has been in full prosperity, the old adobe buildings rapidly giving place to more substantial structures. Founded in 1781 by the Spaniards, it received the name "Town of the Queen of the Angels" as a tribute to the beauty and pleasantness of the spot. It was the capital of the

Mexican State of California from 1836 to 1846, in which latter year it was captured by United States forces.

There is probably no city in the United States which can point to a more phenomenal growth within the last decade than Los Angeles. From a population of 11,180 in 1880 it had increased to 102,479 in 1900. The taxable wealth of the city increased during the same period from \$7,627,632 to \$70,562,307. In other words, the city grew from a mere country town to a metropolis within a score of years. Statistics issued by the Los Angeles Board of Trade, January 1, 1900, show 1,415 manufacturing establishments then in operation. The bonded indebtedness (1902) was \$3,390,000. The city has a public library, a fine county court house, and an efficient police force and fire department. During 1901 the total number of transfers of real estate was 18,545, and the aggregate consideration was \$36,000,000. The city contains fifty church organizations and six hospitals and infirmaries. It has 2,000 telephones in operation. There are seven city parks, hundreds of miles of graded streets, cable and electric lines, many fine hotels, and, in fact, every appurtenance of civilization. Los Angeles is the center of a great trade in fruits, wines, grain, and other produce.

LOT, the ancestor of Moab and Ammon, was the son of Haran and grandson of Terah, and accompanied his uncle Abraham in his migration from Haran to Canaan. At Bethel Lot separated from Abraham, and, while the uncle went on to Hebron, the nephew settled in the district of Sodom. When Jehovah was about to destroy Sodom and the other cities of the plain two divine messengers appeared, spent the night in Lot's house, and next morning led Lot, his wife, and his two unmarried daughters out of the city. His wife looked back and was changed to a pillar of salt, but Lot with his two daughters escaped first to Zoar and then to the mountains east of the Dead Sea, where the daughters, supposing themselves the only survivors of the catastrophe that had destroyed their home, planned and executed an incest by which they became mothers. The sons were ancestors of Ammon and Moab.

LOT, a southwesterly department of central France, corresponding to what was formerly known as Quercy (the country of the Cadurci), a district of the old province of Guyenne, is bounded on the north by Corrèze, on the west by Dordogne and Lot-et-Garonne, on the south by Tarn-et-Garonne, and on the east by Aveyron and Cantal. Its extreme length, from northeast to southwest, is about fifty-two miles, and its breadth from northwest to southeast thirty-one miles, with an area of 2,013 square miles. Population, (1901), 223,736.

LOT-ET-GARONNE, a department of southwestern France, made up of Agenais and Bazadais, two districts of the former province of Guyenne, and Condomois and Lomagne, formerly portions of Gascony, is bounded on the west by Gironde, on the north by Dordogne, on the east by Lot and Tarn-et-Garonne, on the south by Gers, and on the southwest by Landes; its extreme length from southwest to northeast is sixty-two miles, and it has an area of 2,067 square miles. Population (1901), 276,607.

LOTHAIR I., Roman emperor, eldest son of Louis the Pious, was born in 795. At a diet held at Aix-la-Chapelle in 817 he received Austrasia with the greater part of Germany, and was associated with his father in the empire, while separate territories were granted to his brothers Louis and Pippin. This arrangement being modified in favor of Louis' youngest son Charles (afterward Charles the Bald), the three brothers repeatedly rebelled, and for a time Lothair usurped supreme power. After the death of Louis in 840,

Lothair, as his successor, claimed the right to govern the whole empire. His brothers Louis and Charles (Pippin being dead) united against him, and in 841 he was defeated in the great battle of Fontenay. On August 11, 843, the war was brought to an end by the treaty of Verdun, by which Lothair was confirmed in the imperial title, but received as his immediate territory only Italy (which he had ruled from 822) with a long, narrow district reaching past the Rhone and the Rhine to the North Sea. His subsequent reign was full of trouble, for many of his vassals had become virtually independent, and he was unable to contend successfully with the Norsemen and the Saracens. In 855, weary of the cares of government, he divided his kingdom among his sons, and retired to the monastery of Prüm, where he died September 28th of the same year. As emperor he was succeeded by his son Louis II.

LOTHAIR THE SAXON, German king and Roman emperor, was originally count of Supplinburg. In 1106 he was made duke of Saxony by the emperor Henry V., against whom he afterward repeatedly rebelled. In 1133 he was crowned emperor in Rome, by Innocent II., whom he had supported in a disputed papal election. In later times the church pretended that he had done homage to the pope for the empire, but what he really received in fief was the hereditary territory of the Countess Matilda. Lothair secured other important adherents by giving North Saxony (afterward Brandenburg) to Albert the Bear, and Thuringia (which he took from Landgrave Hermann) to Count Louis. In his relations to the neighboring populations Lothair acted with great vigor. The duke of Bohemia and the duke of Poland were compelled to do homage, and the margrave of Meissen and the county of Burgundy he gave to two of his supporters, the former to Count Conrad of Wettin, the latter to Duke Conrad of Zähringen. The kingdom of the Abotrites he granted to the Danish king Cnut; and Cnut's successor Magnus was forced to accept it as a fief of the empire. In 1136 Lothair undertook a second expedition to Italy for the defense of Pope Innocent II. against Roger of Sicily, and after accomplishing his object he died on December 3, 1137, in an Alpine hut near Trent, on his way back to Germany.

LOTHIAN, LOTHENE, LAODONIA, a name whose origin is unknown, now preserved in the three Scottish counties of East, West, and Mid Lothian—HADDINGTON, LINLITHGOW, and EDINBURGH (*q.v.*)—originally extended from the Forth to the Tweed. The Forth separated it from Celtic Alba, and the Tweed from the southern part of Bryneich (Bernicia). Its western boundaries appear to have been the Cheviots and the Lowthers.

LOTTERIES. The word lottery has no very definite signification. It may be applied to any process of determining prizes by lot, whether the object be amusement, or gambling, or public profit. In the Roman Saturnalia and in the banquets of aristocratic Romans the object was amusement; the guests received *apophoreta*. The same plan was followed on a magnificent scale by some of the emperors. Nero excited the people by giving such prizes as a house or a slave. Helioabalus introduced an element of absurdity—one ticket for a golden vase, another for six flies. This amusing custom descended to the festivals given by the feudal and merchant princes of Europe, especially of Italy; and it afterward formed a prominent feature of the splendid court hospitality of Louis XIV. In the Italian republics of the sixteenth century the lottery principle was applied to encourage the sale of merchandise. The lotto of Florence and the seminario of Genoa are well known, and Venice established a monopoly and drew a considerable revenue for the state. The

first letters patent for a lottery in France were granted by Francis I., and in 1656 the Italian Tonti (the originator of "Tontines") opened another for the building of a stone bridge between the Louvre and the Faubourg St. Germain. The institution became very popular in France, and gradually assumed an important place in the government finance. The parliaments frequently protested against it, but it had the support of Mazarin, and Pontchartrain by this means raised the expenses of the Spanish Succession War. Necker, in his *Administration des Finances*, estimates the public charge for lotteries at 4,000,000 livres per annum. There were also lotteries for the benefit of religious communities and charitable purposes. The *Loterie Royale* was ultimately suppressed in 1836. Under the law of May 29, 1844, lotteries may be held for the assistance of charity and the fine arts. Lotteries were suppressed in Belgium in 1830, but they still figure largely in the State budgets of Germany, Holland, Spain, and Italy.

In England the earliest lotteries sanctioned by government were for such purposes as the repair of harbors in 1569, and the Virginia Company in 1612. In 1696 lotteries, with the exception of the Royal Oak lottery, were prohibited as common nuisances, by which children, servants, and other unwary persons had been ruined. This prohibition was in the eighteenth century gradually extended to illegal insurances on marriages and other events, and to a great many games with dice, such as faro, basset, hazard, except backgammon and games played in the royal palace. In spite of these prohibitions, the government from 1709 down to 1824 showed a bad example to the nation by annually raising considerable sums in lotteries authorized by Act of Parliament.

The American Congress of 1776 instituted a national lottery. The scheme was warmly advocated by Jefferson and other statesmen, and before 1820 at least seventy Acts were passed by Congress authorizing lotteries for various public purposes, such as schools, roads, etc.—about 85 per cent. of the subscriptions being returned in prizes.

As time passed on the evils of the lottery system were dealt with by legislation, and, with few exceptions, the various States prohibited them. But for many years Kentucky allowed them, and up to the present time the Louisiana lottery swindle is in full force. It has a charter from the State, in consideration of which it pays a considerable sum to the State treasury, and supports certain charities in New Orleans. The drawing is conducted with much pomp and ceremony, and is presided over by two distinguished ex-generals of the Confederate service. Probably it is fairly conducted, or in other words, there is no attempt made to deprive the lucky subscribers of their chance of winning. But, taking the representations of the lottery company at their face value, the amount paid or promised to be paid as prizes is less than half the amount of the subscriptions. In addition to this all the tickets not sold are held by the lottery company, and drawn for their benefit. In spite of these facts the passion for gambling is so firmly implanted in the human breast that in every city in the Union thousands of lottery tickets are sold at each drawing. The managers of the lottery advertise extensively, and in defiance of State laws maintain offices in all large cities. The charter given by the Louisiana Legislature is about to expire by limitation, and in the spring of 1890 the managers of the legalized robbery made an attempt to secure a charter from the legislature of North Dakota. Fortunately for public morality the scheme was exposed by the press, and, in spite of bribery and corruption, the attempt to perpetuate this most objectionable and demoralizing form of gambling did not prevail.

LOTUS-EATERS were a Libyan tribe known to the Greeks as early as the time of Homer. Herodotus describes their country as in the Syrtic district, and says that a caravan route led from it to Egypt. The lotus still grows there in abundance.

LOTZE, RUDOLPH HERMANN, was born May 21, 1817, in Saxony, and died at Berlin July 1, 1881. The incidents of the life of a philosopher, especially if his career has been exclusively an academic one, are usually passed over as unimportant. In external events no life could be less striking than that of Lotze, who, moreover, was of a retiring disposition, and was forced through delicate health to seclude himself from even such external excitement and dissipation as the quiet university town of Göttingen, where he passed nearly forty years of his life, might afford. Lotze's first essay was his dissertation *De Futura biologie principibus philosophicis*, with which he gained (1838), the degree of doctor of medicine after having only four months previously got the degree of doctor of philosophy. But, though he laid the foundation of his philosophical system very early, in his *Metaphysik* (Leipsic, 1841) and his *Logik* (1843), and commenced lecturing when only twenty-two years old on philosophical subjects, in Leipsic, though he accepted in 1844 a call to Göttingen to fill the chair of philosophy which had become vacant through the death of Herbart, he did not proceed to an exhaustive development of his peculiar views till very much later, and only during the last decade of his life, after having matured them in his eminently popular lectures, did he with much hesitation venture to present his ideas in something like a systematic form.

LOUDON, capital of an arrondissement in the department of Vienne, France, stands on an eminence of 320 feet, overlooking a fertile plain forty-five miles (by rail) southwest from Tours. Population about 5,000.

LOUGHBOROUGH, the second town in Leicester-shire, England, on the Midland Railway, eleven miles from Leicester and fourteen from Nottingham. In 1901 its three parishes had a population of about 16,000.

LOUIS I., Roman emperor (called "der Fromme," also "le Dëbonnaire"), was born in 778. He succeeded his father Charlemagne in 814, having in the previous year been declared co-regent. At the beginning of his reign he excited high anticipations by the earnestness with which he attacked the abuses that had accumulated during the later years of Charlemagne's sovereignty. A period of trouble and confusion was opened in 817, when Louis, anxious to establish the order of succession, declared his eldest son Lothair his successor, and made him co-regent, granting him Austrasia, with the greater part of Germany. The younger sons of Louis, Pippin and Louis, received, the former Aquitania, the latter Bavaria, Bohemia, Carinthia, and the subject Slavonic and Avar territories. This arrangement was resented by Bernard, king of Italy, the emperor's nephew, who forthwith rebelled. He was soon captured, and condemned to the loss of his sight, while his kingdom was transferred to Lothair. After the death of Bernard, the emperor, who was a man of gentle and sensitive temper, bitterly repented the harsh punishment which he had sanctioned, and, being further depressed by the death of his first wife, he proposed to resign the crown and retire to a monastery. He was induced to abandon this intention, and (in 819) to marry Judith, the beautiful daughter of Count Welf, of Bavaria. In 829 he made a new division of the empire in favor of Charles (afterward Charles the Bald), his son by his second wife. The Empress Judith was condemned to the cloister for alleged infidelity to her husband, and Louis was virtually deposed. Pippin and the younger Louis, suspecting that Lothair meant to

usurp exclusive authority, changed their policy, and at a diet in Nimeguen the emperor was restored. Soon afterward he provoked fresh disturbance by granting Aquitania, the territory of Pippin, to Charles, and in 833 the army of the three brothers confronted that of their father near Colmar. When Louis was negotiating with Pope Gregory IV., who had crossed the Alps in the hope of restoring peace, his troops were persuaded to desert him, and on the Lügenfeld ("the field of lies") he was obliged to surrender to his sons. The empress was sent to Italy, her son to the monastery of Prüm, and, at Soissons, Louis not only abdicated, but made public confession of his sins, a long list of which he read aloud. After the death of Pippin, in 838, Louis proposed a scheme by which the whole empire, with the exception of Bavaria, would have been divided between Charles and Lothair, to whom the empress had been reconciled. The younger Louis prepared to oppose this injustice, and he was supported by the people of Aquitania, in the interest of Pippin's sons. A diet was summoned at Worms to settle the dispute, but before it met the emperor died on an island in the Rhine, near Mainz, on June 20, 840. His son Lothair I. succeeded to the imperial title.

LOUIS II., Roman emperor, grandson of the preceding, was born about 822 and crowned king of Lombardy in 844. From 849 he shared the imperial title with his father, Lothair I., being crowned at Rome by Leo IV. in 850. He succeeded to the undivided but almost entirely nominal dignity in 855. On the death of his childless brother, Lothair of Lorraine, in 869, the inheritance was seized and shared by his uncles Charles the Bald and Louis the German; the pope, however, espoused the cause of the emperor, crowning him king of Lorraine in 872. Louis II. died in 875, and the imperial crown was forthwith bestowed on Charles the Bald.

LOUIS III., Roman emperor, surnamed "The Blind," was the son of Bosó, king of Provence, and, through his mother, grandson of the emperor Louis II. He was born about 880, called to the throne of Provence in 890, and crowned emperor in succession to Berengar I. at Rome in 901. In 905, while residing at Verona, he was surprised by his disrowned rival, blinded, and ultimately sent back to Provence, where he lived in inactivity and comparative obscurity until 929.

LOUIS THE CHILD, though he never actually received the imperial crown, is usually reckoned as the emperor Louis III. or Louis IV. He was the son of the emperor Arnulf, was born in 893, and succeeded to the throne of East Francia or Germany in 900, when he was six years of age. During his brief reign Germany was desolated by the Hungarians, who invaded the country year after year, defeating every force that ventured to oppose them. Louis, the last of the Carolingian race in Germany, died in 911.

LOUIS IV. (or V.), "the Bavarian," German king and Roman emperor, was born in 1286. He was the son of the duke of Bavaria, and in 1314, after the death of the emperor Henry VII., was elected to the throne by five of the electors, the others giving their votes for Frederick, duke of Austria. This double election led to a civil war, in which Frederick was supported by the church and by many nobles, while the inhabitants of the great cities rallied round Louis. In 1322 Louis gained the battle of Mühldorf, taking Frederick prisoner; but the war still went on. Pope John XXII. excommunicated Louis in 1324; whereupon, wishing to bring the conflict to an end, Louis offered to liberate Frederick on condition that he would withdraw his claim to the throne, and restore the cities and imperial lands seized

by his party in Swabia. Frederick, finding that the obstinacy of his brother, Duke Leopold, would render it impossible to fulfill these terms, returned to captivity; and Louis was so touched by his magnanimity that he proposed that they should share the responsibilities of government. The plan was tried but did not succeed, and was virtually abandoned before Frederick's death in 1330. In 1327 Louis had gone to defend his rights in Italy, where he was crowned emperor by Pope Nicholas V., whom he supported in opposition to Pope John XXII. Returning to Germany in the year of Frederick's death, he made peace with the house of Austria, but John XXII. refused to be conciliated, and his successor Benedict XII., acting in part under the influence of France, continued the struggle. Irritated by the revival of papal pretensions which no longer commanded respect in Germany, the electors met at Rhense, and on July 15, 1338, issued an important declaration to the effect that the emperor derived his right to German and imperial crowns, not from the pope, but from the electors by whom he was appointed. As the representative of national independence, Louis might have made himself one of the most popular of the emperors, but he excited bitter jealousies by his grasping and unscrupulous disposition. By his marriage with Margaret, the sister of Count William of Holland, he secured Holland, Zealand, Friesland, and Hainault; and he obtained the mastery of Tyrol by separating the heiress, Margaret Mautasch, from her husband, a son of John, the powerful king of Bohemia, and making her the wife of his own son Louis, to whom (in 1322) he had granted the march of Brandenburg. The enemies he thus created were reinforced by Pope Clement VI., who not only excommunicated him again, but (in 1346) persuaded a party of the electors to appoint a new king. Their choice fell on Charles, margrave of Moravia, the son of King John of Bohemia, who at once made an unsuccessful attempt to recover Tyrol. The outbreak of a new civil war was prevented by the sudden death of Louis at a bear hunt near Munich, on October 11, 1347.

LOUIS, THE GERMAN, son of the emperor Louis I., was born in 804. In the first partition of the empire, in 817, he received Bavaria, Bohemia, Carinthia, and the subject territories on his eastern frontier. Displeased by later schemes of partition in favor of his half-brother Charles, he associated himself with his brothers Lothair and Pippin against the emperor, and he was in the field in defense of his rights when his father died. After the emperor's death, in 840, Louis and Charles united against Lothair, whom they defeated in the battle of Fontenay, and in 843 Louis received by the treaty of Verdun the whole of Germany to the east of the Rhine, with Mainz, Spire, and Worms on the left bank. He was a wise and vigorous ruler, but his forces were inadequate to protect the northern part of his kingdom against the Norsemen, and he was not always successful in his wars with Slavonic tribes. In 858 he invaded West Francia, which he hoped to unite with East Francia, his own state; but Charles the Bald proved to be stronger than Louis had supposed, and he was obliged to retreat. When Lothair of Lorraine died, in 869, his kingdom was seized by Charles, who caused himself to be crowned at Metz; but in the following year, by the treaty of Mersen, the eastern half of the country was ceded to Louis. Louis expected to receive the imperial crown after the death of the emperor Louis II. Charles, however, outwitted him, and Louis was attempting to avenge this supposed wrong when he died at Frankfurt on August 28, 876. East Francia and West Francia were again united under Charles the Fat; but, as Louis was the first sovereign

who ruled over the Germans, and over no other Western people, he is generally considered the founder of the German kingdom.

LOUIS I., king of France, surnamed Le Débonnaire or the Pious. (See LOUIS I., emperor, *ante*.)

LOUIS II., surnamed Le Bègue or the Stammerer, the son of Charles I. ("The Bald") by Irmentrud of Orleans, and the grandson of Louis the Pious, was born on November 1, 846. On the death of his elder brother Charles, the second son of Charles the Bald, he was consecrated king of Aquitania in 867, and ten years afterward he succeeded his father, being crowned by Hincmar of Rheims under the title of "king of the French, by the mercy of God and the election of the people" (December 8, 877). In the following year (September 7th) he availed himself of the presence of Pope John VIII. at Troyes to obtain a fresh consecration. He died at Compiègne, after a feeble and ineffectual reign of eighteen months, on April 10, 879.

LOUIS III., son of the preceding by Ansgarde, daughter of Count Hardouin of Brittany, was born about the year 863, and in 879 was designated by his father sole heir to the French throne. It was decided among the nobles, however, that the inheritance should be divided between Louis and his younger brother Carloman, the former receiving Neustria, or all France north of the Loire, and the latter Aquitania and Burgundy. On the Loire and elsewhere the two brothers inflicted several defeats on the Northmen (879-881); but in 882 Louis succumbed to the fatigues of war, leaving his inheritance to Carloman.

LOUIS IV., surnamed D'Outremer (Transmarinus), son of Charles III. ("The Simple") and grandson of Louis II., was born in 921. In consequence of the disasters which befell his father in 922, Louis was taken by his mother Odgiva, sister of Athelstan, to England, where his boyhood was spent—a circumstance to which he owes his surname. On the death of Raoul or Rodolph of Burgundy, who had been elected king in place of Charles, the choice of Hugh the Great, count of Paris, and the other nobles, fell upon Louis, who was accordingly brought over the Channel and consecrated in 936. His *de facto* sovereignty, however, was confined to the countship of Laon. In 939 he became involved in a struggle with Otto I. ("The Great") of Germany, about Lorraine, which had transferred its allegiance to him; the victory remained at last with the emperor, who married his sister Gerberga to Louis. After the death of William Longword, duke of Normandy, Louis endeavored to strengthen his influence in the duchy by obtaining possession of the person of Richard the infant heir, but a series of intrigues resulted only in his own captivity at Rouen in 944, from which he was not released in the following year until he had agreed to surrender Laon to his powerful vassal Hugh the Great. By the interposition of Otto, the brother-in-law of Louis, Hugh, who for some years had effectually resisted both the carnal resources of the empire and the spiritual weapons of the church, was at last persuaded to restore Laon. The last years of this reign were marked by repeated Hungarian invasions of France. Louis died in 954, and was succeeded by his son Lothaire.

LOUIS V., Le Fainéant, son of Lothaire and grandson of Louis IV., the last of the Carolingian dynasty, was born in 966, succeeded Lothaire in March, 986, and died in May, 987. He was succeeded by Hugh Capet.

LOUIS VI., surnamed Le Gros, L'Éveillé, and Le Batailleur, the son of Philip I. of France and Bertha of Holland, was born about 1078, was associated with his father in the government in 1100, and succeeded him in 1108. He died on August 1, 1137.

LOUIS VII., Le Jeune and Le Pieux, son of Louis VI., was born in 1120, and was associated with his father on the death of his elder brother Philip in 1131, being crowned at Rheims on October 25th by Pope Innocent II. He succeeded to the undivided sovereignty in 1137, the news of his father's death reaching him as he was engaged at Poitiers in the festivities connected with his unlucky marriage to Eleanor of Aquitania. In 1141 he made an unsuccessful attempt to assert his rights as duke of Aquitania over the courtship of Toulouse, and in 1142 he fell into a vehement quarrel with Pope Innocent II., who had presumed too much on the piety of the well-brought-up young prince by appointing a nephew of his own to the archbishopric of Bourges. In the course of the contest Louis, who had been excommunicated, pursued the new archbishop into the territory of the count of Champagne, and stormed Vitry, in the sack of which the cathedral was burned, causing the death of three hundred persons who had taken refuge within its walls (1143). Louis made peace with the pope and his secular adversary, but found that nothing less than a pilgrimage to the Holy Land would suffice to expiate his offense. The capture of Edessa and the massacre of the Christians in 1144 led to the preaching of the second crusade by St. Bernard, and in 1147 the king, leaving the regency in the hands of the Abbé Suger and Raoul, count of Vermandois, set out for the East, accompanied by his queen, a large company of nobles, and twenty-four thousand men. The result of the expedition was most disastrous. In 1178 he made a pilgrimage to the tomb of St. Thomas of Canterbury on behalf of his eldest son Philip Augustus, then dangerously ill, and in the following year he associated him with himself in the sovereignty. Louis died on September 18, 1180.

LOUIS VIII., surnamed *Le Lion*, born on September 5, 1187, was the son of Philip Augustus, whom he succeeded in July, 1223. In 1200 he had married Blanche of Castile, the granddaughter of Henry II. of England and in virtue of this connection he received from the English barons in 1216 an offer of the crown, which he accepted. Landing in England in May, he achieved several military successes, but retired early in 1217; later in the same year he renewed the attempt to make good his claims, but finally quitted English soil in September. He next took charge of the war against the Albigenses with varying success; it continued after his accession to the throne, and ultimately proved fatal to him. He died, most probably of pestilence, shortly after the capture of Avignon, at Montpensier in Auvergne on November 8, 1226, and was succeeded by his son Louis IX.

LOUIS IX., SAINT (born 1215; died 1270). He was canonized by Boniface VIII. in 1297, and is commemorated in the Roman Catholic Church on August 25 or 26. He was succeeded by his son Philip III.

LOUIS X., Le Hutin, was the eldest son of Philip IV. (the Fair) and Joan of Navarre, and was born in 1289. He succeeded his mother in the kingdom of Navarre and courtships of Champagne and Brie in 1305. He succeeded his father in 1314, and died, after a short and unimportant reign of less than two years, in June, 1316. He was followed by his brother Philip V.

LOUIS XI., son of Charles VII. and Mary of Anjou, was born at Bourges on July 3, 1423. His jealous, ambitious, and restless character early manifested itself in the attitude of opposition he assumed to his father's mistress Agnes Sorel, and in the part he took (1439) as leader of the "Praguerie," as the league formed by the nobles against the introduction of a standing army was called. Though pardoned by his father in 1440, after the failure of the attempt, he never thenceforward en-

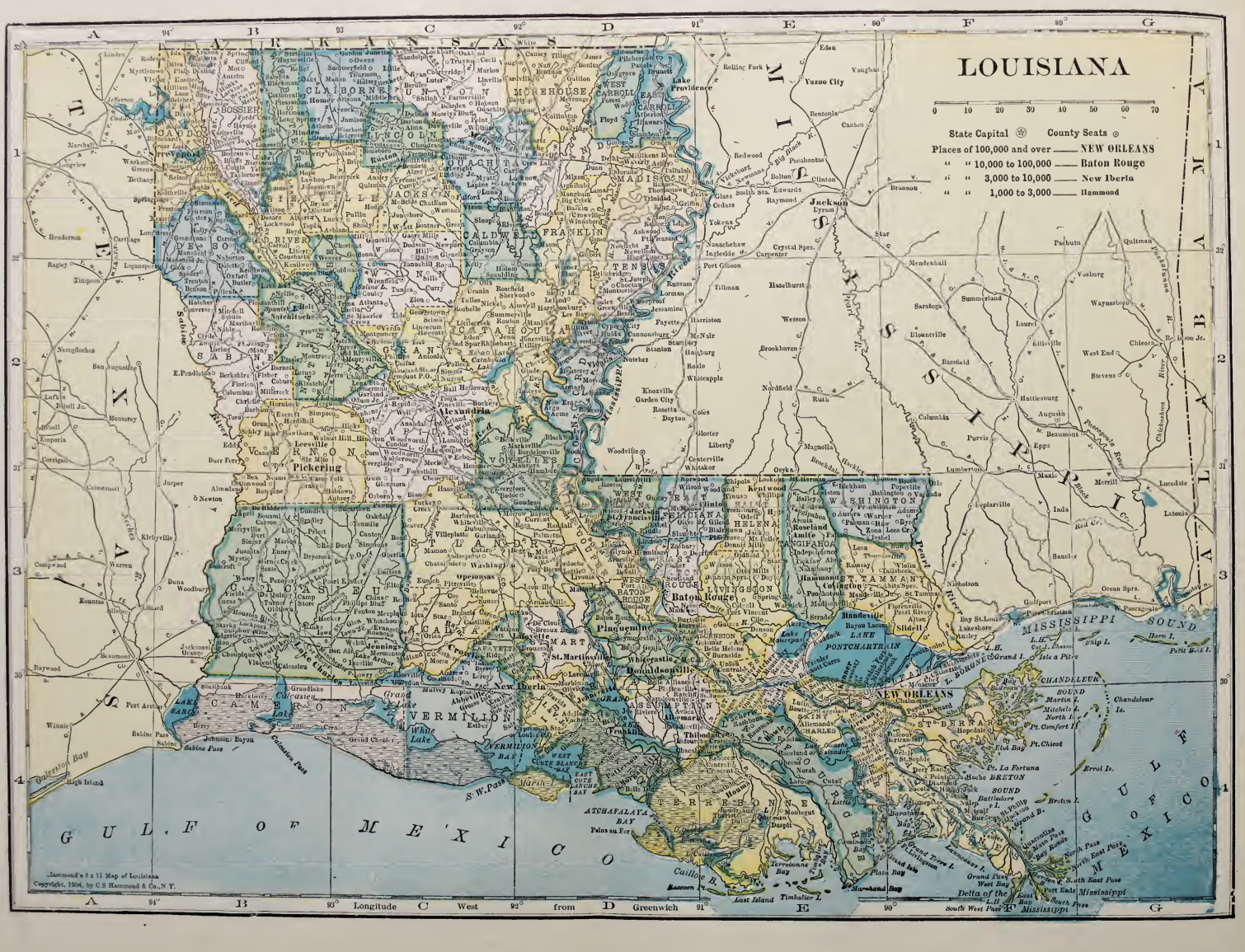
joyed any of his confidence. He distinguished himself, in the years immediately following, in several military expeditions, but finally settled (1446) in his appanage of Dauphiné, where he acted with great independence, until, in 1456, Charles, irritated by the intrigues of his son, intimated his intention of himself resuming the government of that province. Not waiting the arrival of the army which had been sent to take possession, Louis fled for protection to his uncle the duke of Burgundy, who assigned him a pension and a residence at Nieppe, near Brussels. The death of Charles on July 22, 1461, permitted his return to France, where he was crowned at Rheims as Louis XI. in the following month. For the leading events of the three periods of his reign the reader is referred to the article *FRANCE*. He died at Plessis-lès-Tours on August 30, 1483, and was succeeded by his son Charles VIII.

LOUIS XII. was born at Blois in 1462. His father was Charles, duke of Orleans, the grandson of Charles V. and the cousin of Charles VII., who spent twenty-five years of captivity in England, and who still holds an honorable place on the roll of French poets. Louis himself was for three years (1487-90) the prisoner of his second cousin, Charles VIII., in the castle of Bourges, but afterward seconded his ambitious schemes faithfully and well, and on his death (1498) succeeded him, taking the titles of king of France, Jerusalem, and the Two Sicilies, and duke of Milan. He died on January 1, 1515, and was succeeded by Francis I.

LOUIS XIII., the son of Henry IV. and Mary de' Medici, was born at Fontainebleau on September 27, 1601, and succeeded his father on May 14, 1610, his mother meanwhile availing herself of the confusion caused by the assassination to seize the regency. For some years the affairs of the kingdom were directed by the council of regency in which the Florentine Concini, created Marquis d'Ancre and marshal of France, was the most prominent figure. After the assassination of d'Ancre in 1617, Marshal Luyennes, the favorite of the weak young king, held the reins of power for about four years; his death of camp fever in the end of 1621, in the course of the Huguenot campaign, left Louis free to assert his own independence, which he did by carrying on the war with some vigor until its termination in the peace of Montpellier (1622). In 1624 Richelieu entered the council of state, and guided the affairs of Louis and of France for the next eighteen years. Louis, who died at St. Germain-en-Laye on May 14, 1643, was married at the age of fourteen (December, 1615) to Anne of Austria, daughter of Philip III. of Spain; but his eldest son, who succeeded him as Louis XIV., was not born until twenty-three years afterward.

LOUISIANA PURCHASE EXPOSITION, probably known as the Universal Exposition, held in the city of St. Louis, Missouri, from April 30, 1904, the day of the opening, until December 1, 1904. It celebrated the 100th anniversary of the purchase of the Louisiana tract of land from France, out of which the following States have been carved: Missouri, Oklahoma, Arkansas, Minnesota, Wyoming, Indian Territory, South and North Dakota, Nebraska, Louisiana, Montana, Iowa, Kansas, and Colorado. The treaty was signed by Napoleon and Thomas Jefferson, and the price paid was \$15,000,000.

The Exposition entailed an expenditure of at least \$50,000,000, beginning with the sum of \$15,000,000, of which \$5,000,000 was raised by popular subscription, \$5,000,000 subscribed by the city of St. Louis through a bond issue and \$5,000,000 donated by the United States government. Most prominent among those who had the fair in charge were: President, David R. Francis; Director of Work, Isaac Taylor; Director of Exhibits, F. J. V. Shift; Director of Concessions and Admissions, Norris B. Gregg; and Secretary, Walter B. Stevens. The Exposition covered a ground space inside the fences of



LOUISIANA

0 10 20 30 40 50 60 70

- State Capital County Seats
- Places of 100,000 and over — NEW ORLEANS
- “ 10,000 to 100,000 — Baton Rouge
 - “ 3,000 to 10,000 — New Iberia
 - “ 1,000 to 3,000 — Hammond

1,240 acres, and comprised upward of three hundred buildings, ranging in size from the Palace of Agriculture, which covered about twenty acres, to the intramural stations, which were mere dots on the landscape.

Many of the foreign nations produced historic buildings as their national pavilions; Great Britain reproduced the Orangery, or banqueting hall of Kensington Palace, London; France, the Grand Trianon and a section of the Garden of Versailles; China, the Palace of Prince P'n Lun; India, the Tomb of Etmad Dowlah at Agra, and so on. The cost of these national pavilions ranged from \$17,000 to \$1,000,000.

Nearly every State in the Union erected a building to be a club-house to those of its inhabitants who visited the Exposition, these State buildings ranging in cost from \$20,000 to \$1,000,000. The total amount of appropriations made toward the erection of these State buildings on December 1, 1903, was \$6,739,986. As with the foreign nations, a number of the States reproduced their historic buildings; thus Louisiana reproduced the Cabildo at New Orleans, where the transfer of the Louisiana Territory from France to the United States took place in 1803. Virginia reproduced Monticello, the home of Thomas Jefferson; Texas erected a building shaped like a five pointed star to symbolize its name of the "Lone Star State"; Maine built a typical log cabin hewn from rough lumber by lumbermen; the State of Washington erected a wigwam of timbers one hundred feet long, with a section two feet square, all of these buildings being characteristic of the States they represented.

The "Main Picture" of the Exposition was a composition of buildings and avenues in the shape of a fan, the avenues forming the ribs. At the point where these avenues converged the "clou" of the Exposition was situated. This was an architectural composition occupying the slope of a natural hill. Down the hill three cascades poured, the largest ever known. At the source of each of these cascades was a highly ornate circular building, the central one being the Festival Hall, a great auditorium. The two on the side were Restaurant pavilions. These three were connected by a semicircular colonnade, between the columns of which there were disposed symmetrically gigantic statues, each symbolical of one of the fourteen States in the Louisiana Territory. Each statue was designed by a different sculptor, and each represented a seated, draped female figure. The three cascades emptied at the foot of the hill into a big basin of Titanic proportions from which branched a lagoon system which touched every one of the eight exhibit buildings in the picture and completely surrounded two of them. The lagoon, in the central avenue, was 300 feet wide. This central avenue was further enriched by the Louisiana Purchase Monument, a towering, sculpture-decked shaft, and a number of fine equestrian and portrait statues by famous American sculptors. All of the buildings in the main picture were ivory white, with mural paintings on screen walls and in shaded places. All of the palaces on the main avenue had colonnade façades and three of them had inner courts of great beauty. The palaces in the main picture were as follows:

The Palace of Transportation covered an area of 525 x 1300 feet, or 15.6 acres. Its cost was \$692,000. It was designed by the architects of the Division of Works. It combined in its exterior the architectural features of an exposition building and of a railroad station. These features were giant arches, flanked by great bottle-shaped pylons which towered hundreds of feet into the air. It contained about five miles of railroad track.

The Palace of Varied Industries covered an area of 526 x 1200 feet, or 14.5 acres. Its cost was \$712,680. The building showed two domes and a number of Spanish steeples, besides a semi-circular colonnade of peristyle unlike anything hitherto seen in architecture.

The Palace of Manufactures covered an area of 525 x 1200 feet, or 14.5 acres. Its cost was \$719,400. Its chief beauty lay in its fine domed roof and a cloister-surrounded inner court of rare beauty.

The Machinery Hall covered a foot space of 526 x 1000 feet, or 12.2 acres and cost \$510,090. A forest of German

towers of various heights marked the building, while a frankly exposed sloping roof furnished a background for them.

The Palace of Liberal Arts, while not so expansive, was none the less worthy of admiration. It covered an area of 525 x 750 feet, or 9.1 acres and cost \$47,917. Its entrance pavilions formed its most noteworthy feature, its main entrance rising to a height of 110 feet and the screen wall being decorated with a fine processional frieze.

The Palace of Mines and Metallurgy covered an area of 525 x 750 feet, or 9.1 acres and cost \$498,000. In place of a cornice it showed an overhanging roof covered with red tiles, its entrance decorations were gigantic Egyptian obelisks and its colonnade was made of piers instead of columns.

The Palace of Education covered the same foot space as the Palace of Liberal Arts and the Palace of Mines and Metallurgy; viz., 525 x 750 feet or 9.1 acres. Its cost was \$367,363 and was the most classic of the exhibit buildings. Its entrances were triumphal arches and its colonnade pure Corinthian.

The Palace of Electricity also covered an area of 525 x 750 feet, or 9.1 acres, and cost \$415,352. The design showed pedestals for statues which, at the main points, were thrown high into the air to form towers.

A few of the important and curious things which were seen at the Louisiana Purchase Exposition may be summed up as follows:—

Floral clock, 100 feet in diameter, hands 50 feet long. Seventy-five thousand square yards of sod laid in cascade territory.

Map of the United States in growing crops covered an area of five acres.

Ninety thousand gallons of water per minute over the cascades.

Natural garden, where all North American wild flowers grew.

The largest silver nugget ever mined, weighed five tons.

The largest gas-engine ever made, 3,000 horse-power.

A tree 400 years old when Columbus discovered America.

Liberty Bell in the rotunda of the Pennsylvania building.

The Louisiana Purchase treaty, the actual document signed by Napoleon and Jefferson.

The largest bird-cage in the world, contained every species of bird in North America under natural surroundings of foliage and flight. Cage was 300 feet long and admitted the visitor to it through a tunnel.

Silver, gold and lead mines in operation on the grounds.

A rose garden six acres in area contained 50,000 rose bushes.

Largest pipe organ ever built, 145 stops, pipes five feet in diameter.

A mammoth cheese weighing two tons.

Walls of ancient Manila reproduced in Philippine Exhibit.

A cluster of pearls found in Sharks Bay, West Australia, containing 150 pearls in a cluster and valued at \$100,000.

*LOUISIANA, named for Louis XIV. of France, by whose subjects it was discovered and explored, was the fifth State to be added to the original thirteen, and is now the twenty-third in population. It was the first State to be created west of the Mississippi River, and the first having a frontage upon the Gulf of Mexico.

Description.—Louisiana is defined on the north by the parallel of 33° north latitude west of the Mississippi River, that line dividing it from the State of Arkansas. On the east the Mississippi River divides it from the State of Mississippi down to the parallel of 31° north latitude, which line then divides it from Mississippi as far east as the Pearl River, that river then forming the dividing line between Louisiana and Mississippi to the Gulf. At the south is the Gulf of Mexico. At the west the line is arbitrarily drawn a little west of the meridian of 94° west from Greenwich as far south as the Sabine River in latitude 32°, and thence follows the Sabine to the Gulf. The State

thus lies between 28° 50' and 33°, north latitude, and 89° and 94° 20' longitude west from Greenwich. Its area is 45,420 square miles of land and 3,300 square miles of water. The surface is probably more uniformly low and level than any other equal area in the United States. The highest elevation is only 485 feet above tide level, and the average elevation is scarcely 75 feet. The general slope is toward the east and south, to the Mississippi River and the Gulf of Mexico. The Mississippi River bounds it for 150 miles and flows through it for 150 miles more. The Red River, a large stream, traverses it from northwest to the east centre. Other considerable streams are the Black, Washita, Tensas, and Calcasieu rivers. Large lakes abound in nearly all parts of the State. The geological formations are Tertiary and Quarternary, much of the State consisting of alluvial drift. The climate is subtropical. The winter temperature at New Orleans is from 52° to 62° Fahrenheit, and the summer temperature from 80° to 84°. The rainfall averages more than 51 inches.

Resources and Products.—The richness of the soil, the abundance of moisture, and the genial warmth of the climate, produce a wealth of vegetation, and mark Louisiana as a great agricultural State. The forest trees comprise pine, oak, cypress, ash, hickory, walnut, cottonwood, magnolia, and many others. The State is one of the most heavily wooded in the Union, and its wealth in lumber is enormous. Sugar and cotton are the chief agricultural staples, though tobacco of finest quality is grown, and fruits, vegetables, corn, and many other crops are cultivated with much success. Oranges, figs, and other tropical fruits abound. Louisiana is the foremost cane sugar country in the world, its product ranging from 600,000,000 to more than 700,000,000 pounds a year, or more than nine-tenths the entire output of the United States. The State produces also nearly a million bales of cotton a year. The salt industry is a large one, but there are no other mineral products of importance. There are considerable manufactures, chiefly of lumber, boots and shoes, clothing, and machinery, besides, of course, preparing cotton, sugar and tobacco for market.

Government.—A trace of the old French regime is retained in the division of the State into 59 parishes, which correspond with the counties of other States. The metropolis is New Orleans, but the political capital is Baton Rouge. The chief State officers are a Governor, Lieutenant Governor, Secretary of State, Auditor, Treasurer, Attorney-General, Superintendent of Public Instruction, and Land Commissioner, elected for four years each, and a Chief Justice elected for twelve years. The biennial Legislature consists of two houses. There is a free public school system, which is steadily being improved. There are also a State University with an Agricultural and Mechanical College, a Normal School, the Southern University endowed by the State, and Tulane University in which coeducation and manual training exist. The State maintains a large hospital, and asylums for the insane, blind, deaf and dumb.

History.—Louisiana formed a part of the old French empire in America. The French missionaries Marquette and Joliet visited it in 1663, and La Salle in 1682 sailed down the Mississippi River and claimed the country for France, naming it Louisiana, in honor of Louis XIV. The first settlement was made by Iberville in 1699, and was continued by Crozat in the next century. In 1717 Crozat transferred his interests to the famous John Law and his chartered company, and there followed the disastrous speculations known as the "Mississippi Bubble." At the end of the French and Indian War the whole territory was ceded to Spain, but it was returned to France by the Treaty of San Ildefonso in 1800. A long dispute between the United States and Spain and France concerning the navigation of the Mississippi River was ended in 1803 by the purchase of Louisiana by this country, giving the United States full possession of the Mississippi and a frontage on the Gulf of Mexico. The present State of Louisiana was erected into an organized Territory on March 3, 1805, and was admitted to the Union as a State on April 8, 1812, the purchase of the territory and the admission of it to Statehood being among the most important acts in the constitutional development of the United States. The last battle of the War of 1812 was fought at New Orleans on January 8, 1815. In January, 1861, Louisiana followed the example of South Carolina and other States in seceding from the Union and joining the Confederate States. More than a hundred battles were fought within the State and its waters during the Civil War, New Orleans being captured by the National arms on April 24, 1862. The industries of the State were dreadfully ravaged by the war, and suffered much also during the reconstruction period, but have now been restored to prosperity, and New Orleans has resumed its rank as the greatest cotton market in the world.

Population.—The population of Louisiana by decennial periods has been as follows:

Year.	White.	Colored.	Total.
1810	34,311	42,245	76,556
1820	73,383	79,540	152,923
1830	89,441	126,298	215,739
1840	158,457	193,954	352,411
1850	255,491	262,271	517,762
1860	357,629	350,373	708,002
1870	362,705	364,216	726,915
1880	456,291	483,655	939,946
1890	559,389	559,198	1,118,587
1900	730,821	650,804	1,381,625

During most of the last century, therefore, the negro race has outnumbered the white race. In 1810 Louisiana ranked as the 18th State in population; in 1820, the 17th; in 1830 and 1840, the 19th; in 1850, the 18th; in 1860, the 17th; in 1870, the 21st; in 1880, the 22nd; in 1890, the 25th; and in 1900, the 23rd. Its population to the square mile averaged 1.7 in 1810; 3.4 in 1820; 4.7 in 1830; 7.8 in 1840; 11.4 in 1850; 15.6 in 1860; 16.0 in 1870; 20.7 in 1880; 24.6 in 1890; and 30.4 in 1900.

The only city in the State with more than 25,000 population is New Orleans, which in 1880 had 216,090 and ranked ninth among American cities; in 1890 had 242,039 and ranked eleventh; and in 1900 had 287,104 and ranked twelfth.

W. FLETCHER JOHNSON.

LOUISVILLE, the most important place in the State of Kentucky, is situated on the south bank of the Ohio river, where it is interrupted by a series of rapids which, except at high water, oblige the steamboat traffic to make use of the Louisville and Portland Canal (two and one half miles long, constructed in 1833). The city, which has an area of eighteen square miles, and a water front of eight miles, occupies an almost level site about seventy feet above low-water mark. Its plan is regular and spacious, and in the residential portions the houses, for the most part, have lawns and gardens in front. Among the public buildings of importance may be mentioned the city-hall, the court-house, the public library, the female high school, the industrial exhibition building, the Roman Catholic cathedral, and the State school for the blind.

From the time of the introduction of steam navigation upon the Ohio by Fulton in 1812, Louisville rapidly gained in importance as a center of river trade. Owing to its position at the "falls of the Ohio," which obstruction long made necessary the transfer of goods at this point, the city became an important depot of supplies for the cotton-growing States lying immediately to the south. The owners of plantations in those States devoted themselves wholly to the culture of cotton, and relied upon Kentucky for supplies of wheat, Indian corn, oats, and the like cereals, for the hempen bagging and rope used in baling the cotton, and for mules and horses, large droves of which were annually driven south from Louisville. The city was also for many years one of the principal points in the United States for pork-packing.

After the close of the civil war, the development of Kentucky, as of the South generally, entered new channels. Largely increased facilities of railway transportation, while bringing Louisville into more direct competition with Cincinnati, St. Louis, and Chicago, resulted in a marked increase of both its commercial and manufacturing interests, notwithstanding the decline of the river trade. The extensive tobacco crop of Kentucky, with much of that grown in neighboring States, now finds a market at Louisville, instead of at New Orleans as formerly; and it has become probably the largest market in the world for leaf tobacco, the yield

from the manufacture thereof in 1900 was in Louisville alone over \$15,000,000. The manufacture of whisky is also important, this, with that of tobacco, paying to the Federal Government nearly \$3,000,000 annually in revenue taxes, in the Louisville district. Pork-packing employs a capital of \$2,520,000, and the tanning of leather \$3,600,000, this industry being fifty times larger than before the war. The manufacture of agricultural and mechanical implements employs \$1,583,000 capital, the plow factories, which produce 125,000 plows annually, being among the largest in the United States. Steam-power is chiefly employed, the available water-power of the rapids having been neglected. The greater part of the coal consumed by the factories is brought down the Ohio from Pittsburgh. The mountainous eastern portion of the State, rich in vast deposits of both coal and iron, is now penetrated by several railroads, and others are being constructed, whose influence in developing this mineral wealth will add largely to the prosperity of the city.

The Louisville and Nashville Railway, opened in 1859, controls, under one management, nearly 4,000 miles of connected lines, reaching New Orleans, Pensacola, and Savannah. Various other lines contribute to make Louisville an important railway center.

A bridge across the river, 5,218½ feet long between abutments, with twenty-seven spans, and admitting the free passage of steamboats at high water, affords continuous railway transit, and connects the city with the thriving towns of New Albany and Jeffersonville, situated on the opposite bank of the Ohio, in the State of Indiana. A second railway bridge, having wagon-ways and foot-ways in addition, is now finished.

Louisville is provided with adequate water-works, gas-works, etc. The famous Dupont artesian well, 2,066 feet deep, has a flow of 330,000 gallons per day, with a force of ten horse-power, its water resembling slightly that of the Kissingen and Blue Lick (Ky.) springs. Although once regarded as unhealthy, the city has now an effective system of sewerage, and is in good sanitary condition.

The public school system is sustained at an annual expense of over \$300,000. abundant separate provision being made for colored children. There are four medical colleges, having a large attendance and reputation, and numerous private seminaries and schools. There are five daily papers (three English and two German), besides thirteen weekly sheets.

Louisville is a port of entry for foreign imports, which aggregate annually about \$125,000. The city is governed by a mayor, elected every third year, with a board of aldermen and a common council, the former containing one, and the latter two representatives of each of the twelve wards. The population in 1830 was 10,341; in 1840, 21,210; in 1850, 43,196; in 1860, 68,033; in 1870, 100,753; and in 1900, 204,731.

The city contains 200 miles of street-car tracks. It obtains its water supply from the Ohio river, six miles above the wharf, and the water-works have a capacity of 10,000,000 gallons per day. The police force numbers 204 men and costs \$165,000 per annum. The assessed value of property is \$88,300,000, and the tax-levy \$1.98 per \$100. The bonded debt of the city is \$4,983,000. Louisville has thirty-three public schools and 66,000 pupils of school age. The expenditure for school purposes is \$313,571. The city has four important medical colleges. Its church buildings number 142, and it has a polytechnic school and public library and many charitable institutions. Louisville was founded in 1778, and became a town two years later and a city in 1828. In March, 1890, the city was visited by a destructive cyclone, which demolished many blocks of

buildings and caused a loss of 125 lives and several millions' worth of property.

LOULÉ, an old town of Portugal, in the district of Faro and province of Algarve, is situated in an inland hilly district about five miles to the northwest of the port of Faro. It is surrounded by walls and towers dating from the Moorish period, and the principal church is large and fine. The special industry of the place is basket-making. The population is 14,862.

LOURDES, capital of a canton, and seat of the civil court of the arrondissement of Argelès, in the department of Hautes-Pyrénées, France, lies twelve miles by rail south-southwest of Tarbes, on the right bank of the Gave de Pau, and at the mouth of the valley of Argelès. It has grown up around what was originally a Roman castellum, and subsequently a feudal castle, picturesquely situated on the summit of a bare scarped rock. The present fame of Lourdes is entirely associated with the grotto of Massavielle, where the Virgin Mary is believed in the Catholic world to have revealed herself repeatedly to a peasant girl in 1858; the spot, which is resorted to by multitudes of pilgrims from all quarters of the world, is now marked by a large church above the grotto, consecrated in 1876 in presence of thirty-five cardinals and other high ecclesiastical dignitaries.

LOUSE, a term applied indiscriminately in its broad sense to all epizootic parasites on the bodies of other animals. From a more particular point of view, however, it is strictly applicable only to certain of these creatures that affect the bodies of mammals and birds. The former may be considered as lice proper, the latter are commonly known as bird-lice (although a few of their number infest mammalia). Scientifically they are now generally separated into *Anoplura* and *Mallophaga*, although some authors would include all under the former term.

LOUTH, a maritime county in the province of Leinster, Ireland, is bounded on the northeast by Carlingford Bay and the county of Down, east by the Irish Sea, southwest by Meath, and northwest by Monaghan and Armagh. It is the smallest county in Ireland, the area comprising 202,124 acres or 316 square miles. Population (1901), 65,741.

LOUTH, a municipal borough and market-town of Lincolnshire, England, is pleasantly situated on the river Lud, and on a branch of the Great Northern railway, twenty-five miles east-northeast of Lincoln. By means of a canal, completed in 1763, there is water communication with Hull. The town is about a mile in length and is well built and paved. Population (1901), about 14,500.

LOUVAIN, a town of Belgium in the province of Brabant, eighteen miles east of Brussels, on the Liège and Cologne Railway, and on the river Dyle. The population in 1901 was 42,308. Louvain possesses some fine specimens of Gothic art—the town hall, which displays a wealth of decorative architecture almost unequaled on the Continent, and the collegiate church of St. Pierre, with some fine sculptures and panels by Quentin Matsys. It has a famous university.

LOUVIERS, capital of an arrondissement in the department of Eure, France, situated on the Eure (here divided into many branches), seventy-one miles west-northwest from Paris, and some thirteen miles from Rouen and Evreux. The population is 11,000.

LOUVOIS, FRANÇOIS MICHEL LE TELLIER, MARQUIS DE, the great war minister of Louis XIV., was born at Paris on January 18, 1641. His father, Michel le Tellier sprung from a bourgeois family of Paris, but had attached himself to the parlement of Paris, and married the niece of the chancellor Aligre. He won

the favor of De Bullion, the superintendent of finances, and through him obtained the intendency of Piedmont, where he made the acquaintance of Mazarin. He was Mazarin's right hand through the troublous times of the Fronde, and was the medium of communication between him and the queen, when the cardinal was in nominal disgrace at Brühl. He had been made secretary of state in 1643, and on the death of Mazarin was continued in his office. He married his son to a rich heiress, the Marquise de Courtenvaux, and soon began to instruct him in the management of state business. The young man speedily won the king's confidence, and in 1666 was made secretary of state for war in his father's room. His talents were perceived by the great Turenne, in the short war of the Devolution (1667-68), who gave him instruction not so much in the art of war as in the art of providing armies. The peace of Aix-la-Chapelle signed, Louvois devoted himself to the great work of organizing the French army. The years between 1668 and 1672, says Camille Rousset, "were years of preparation, when Lionne was laboring with all his might to find allies, Colbert to find money, and Louvois soldiers for Louis." Louvois' work was not the least important of the three. He understood the new condition of things, and organized a national standing army. The success of his measures is to be seen in the victories of the great war of 1672-78, in which his old instructor Turenne was killed. After the peace of Nimeguen in 1678, Louvois was high in favor, his father Michel le Tellier had been made chancellor, and his only opponent, Colbert, was in growing disfavor. The ten years of peace between 1678 and 1688 were distinguished in French history by the rise of Madame de Maintenon, the capture of Strasburg, and the revocation of the edict of Nantes, in all of which Louvois bore a prominent part. The surprise of Strasburg in 1681, in time of peace, in pursuance of an order of the chamber of reunion, was not only planned but executed by Louvois and Monclar, and after the revocation of the edict of Nantes he claims the credit of inventing the dragonnades. Colbert died in 1683, and had been replaced by Le Pelletier, an adherent of Louvois, in the controller-generalship of finances, and by Louvois himself in his ministry for public buildings, which he took that he might be the minister able to gratify the king's two favorite pastimes, war and buildings. Louvois was able to superintend the successes of the first years of the war of 1688, but died suddenly of apoplexy on July 16, 1691.

LOVAT, SIMON FRASER, BARON, a famous Jacobite intriguer, executed for the part which he took in the rebellion of 1745, was born about the year 1676, and was the second son of Thomas, afterward twelfth Lord Lovat. A prosecution for violence having been instituted against him by Lady Lovat's family, Simon found it prudent to retire first to his native strongholds in the Highlands, and afterward to France, where he at length found his way, in July, 1702, to the court of St. Germans. One of his first steps toward gaining influence there seems to have been to announce his conversion to the Catholic faith. He then proceeded to put the great project of restoring the exiled family into a practical shape. His plan was to land 5,000 French troops at Dundee, where they might reach the northeastern passes of the Highlands in a day's march, and be in a position to divert the British troops till the Highlands should have time to rise. Immediately afterward 500 men were to land on the west coast, seize Fort William or Inverlochy, and thus prevent the access of any military force from the south to the central Highlands. The whole scheme affords strong indication of Lovat's sagacity as a military strategist, and it is observable that

his plan is that which was continuously kept in view in all the future attempts of the Jacobites, and finally acted on in the last outbreak of 1745. He very soon found, however, that there was little disposition to join the rebellion, and he then made up his mind to secure his own safety by revealing all that he knew to the government of Queen Anne. Having by this means obtained a pardon for all his previous crimes, he was sent back to France to act as a spy on the Jacobites. On returning to Paris suspicions soon got afloat as to his proceedings, and in the end he was committed close prisoner in the castle of Angoulême, where he remained for nearly ten years, or till November, 1714, when he made his escape to England. When the rebellion of 1745 broke out Lovat acted with his characteristic duplicity. He represented to the Jacobites—what was probably in the main true—that though eager for their success his weak health and advanced years prevented him from joining the standard of the prince in person, while to the Lord President Forbes he professed his cordial attachment to the existing state of things, but lamented that his headstrong son, in spite of all his remonstrances, had insisted on joining the Pretender, and succeeded in taking with him a strong force from the clan of the Frasers. Lovat's false professions of fidelity did not of course long deceive the government, and after the battle of Culloden he was obliged to retreat to some of the wildest recesses of the Highlands, after seeing from a distant height his castle of Doune delivered to the flames by the royal army. Even then, however, broken down by disease and old age, carried about on a litter and unable to move without assistance, his mental resources did not fail him; and in a conference with several of the Jacobite leaders he proposed that they should raise a body of 3,000 men, which would be enough to make their mountains impregnable, and at length force the government to give them advantageous terms. The project, though by no means a chimerical one, was not carried out, and Lovat, after enduring incredible hardships in his wanderings, was at last arrested on an island in Loch Morar close upon the west coast. He was conveyed in a litter to London, and after a trial of five days sentence of death was pronounced upon him on March 19, 1747. His execution took place on April 9th, following.

LOVE-BIRD, a name somewhat indefinitely bestowed, chiefly by dealers in live animals and their customers, on some of the smaller short-tailed Parrots, from the remarkable affection which examples of opposite sexes exhibit toward each other, an affection popularly believed to be so great that of a pair that have been kept together in captivity neither can long survive the loss of its partner. By many systematic ornithologists the little birds thus named, brought almost entirely from Africa and South America, have been retained in a single genus, *Psittacula*, though those belonging to the former country were by others separated as *Agapornis*.

LOVELACE, RICHARD, English poet, was born in 1618. On the father's side he was a scion of a Kentish family, and inherited a tradition of military distinction, maintained by successive generations from the time of Edward III. Lovelace's fame has been kept alive by a few songs and the romance of his career, and his poems are commonly spoken of as careless improvisations, and merely the amusements of an active soldier. He wrote a comedy, *The Scholar*, when he was sixteen, and a tragedy, *The Soldier*, when he was one and twenty. When the rupture between king and parliament took place, Lovelace was committed to the Gatehouse at Westminster for presenting to the Commons a petition from Kentish royalists in the king's favor. It was then

that he wrote his most famous song, *To Althea from Prison*. He was liberated on bail of £40,000—a sign of his importance in the eyes of the parliament—and throughout the civil war was a prisoner on parole, with this security in the hands of his enemies. His only active service was after 1646, when he raised a regiment for the French king, and took part in the siege of Dunkirk. Returning to England in 1648, he was again thrown into prison. During this second imprisonment he collected and revised for the press a volume of occasional poems, many if not most of which had previously appeared in various publications. The last ten years of Lovelace's life were passed in obscurity. His fortune had been exhausted in the king's interest, and he is said to have been supported by the generosity of more fortunate friends. He died, according to Aubrey, "in a cellar in Longacre, in 1658."

LOVER, SAMUEL, novelist, artist, song-writer, and musician, was born in Dublin in 1797. Lover began life as an artist, and was elected an academican of the Royal Hibernian Society of Arts—a body of which he afterward became secretary. He acquired reputation as a miniature painter; and a number of the local aristocracy sat to him for their portraits. His love for music showed itself at a very early age. At a dinner given to the poet Moore in 1818 Lover sang one of his own songs, which elicited special praise from Moore. One of his best known portraits was that of Paganini, which was exhibited at the Royal Academy. He attracted attention as an author by his *Legends and Stories of Ireland* (1832), and was one of the first writers for the *Dublin University Magazine*. He went to London about 1835, where, among others, he painted Lord Brougham in his robes as lord chancellor. His varied gifts rendered him very popular in society; and he appeared often at Lady Blessington's evening receptions. There he sang several of his songs, which were so well received that he published them (*Songs and Ballads*, 1839). Some of them illustrated Irish superstitions, among these being *Rory O'More*, *The Angel's Whisper*, *The May Dew*, and *The Fourleaved Shamrock*. In 1837 appeared *Rory O'More, a National Romance*, which at once made him a great reputation as a novelist; he afterward dramatized it for the Adelphi Theater, London. In 1842 was published his best known work, *Handy Andy, an Irish Tale*. Meanwhile his multifarious pursuits had seriously affected his health; and in 1844 he gave up writing for some time, substituting instead public entertainments, called by him *Irish Evenings*, illustrative of his own works and his powers as a musician and composer. These were very successful both in Great Britain and in America. In addition to publishing numerous songs of his own, Lover edited a collection entitled *The Lyrics of Ireland*, which appeared in 1858. He died on July 6, 1868.

LOWELL, in Middlesex county, Mass., at the junction of the Concord and Merrimac rivers, twenty-six miles northwest from Boston. It is often called the "Spindle City," and the "Manchester of America," because of the extent of its cotton manufacture. The principal source of its water-power is Pawtucket Falls in the Merrimac, and steam is employed as an auxiliary to the amount of 19,793 horsepower. The first cotton-mill was started in 1823, when the place was the village of East Chelmsford. In 1826 it was made a town, and named Lowell in memory of Francis Cabot Lowell, from whose plans it had been developed, but who died in 1817. It was incorporated as a city in 1836. It originally comprised 2,885 acres, but by annexation from neighboring towns its area has been increased to 8,000 acres, or 12½ square miles.

The population, which in 1836 was 17,633, was 40,928 in 1870, and 59,485 in 1880 (males, 26,855; females, 32,630), and in 1900 (official), 94,969.

The following table shows the extent of the manufacturing industries in 1900:—

Number of industries.....	981
Aggregate capital.....	\$46,578,193
Wage-earners and salaried clerks.....	32,197
Wages and salaries.....	\$12,814,414
Value of materials used.....	\$21,727,844
Value of products.....	\$44,774,525

The capital invested in hosiery and knit goods is \$3,135,987; hands employed, 4,222; value, \$3,148,110; woolen goods, capital, \$3,392,280, hands employed, 1,610; value, \$3,275,613; patent medicines and compounds, capital, \$824,412, hands employed, 507; value, \$1,784,338; boots and shoes, capital, \$373,381, hands employed, 519; value, \$957,035. The capital invested in the cotton goods works is over twenty-one millions, hands employed, 14,000; value, \$17,038,576; yards cotton cloth woven per week, 5,005,756; yards printed per week, 1,650,000; yards dyed per annum, 16,000,000; yards carpeting per week, 75,000; yards woolen cloth per week, 12,500; pounds bleached per annum, 10,000,000; pounds cotton consumed per week, 1,504,293; pounds clean wool per week, 120,000; tons coal per annum (including smithy), 72,136. There are many secondary industries connected with the cotton manufacture, including the making of machinery, elastic and leather goods, tools, boilers, etc., and also a number of small factories for the production of cartridges, chemicals, wire cloth, paper, doors, sash, blinds, and carriages. The foundry and machine-shops employ 3,000 men in the manufacture of machinery, and consume thousands of tons of iron and steel annually. Lowell has thirty-two public day schools, eight evening and four technical schools, a reform school, and two parochial schools. The principal public buildings are the city hall, court-house, Middlesex county jail, Green schoolhouse, and St. John's Hospital. There are nine national banks with a total capital of \$4,000,000, and six savings banks with deposits of \$16,000,000. The religious congregations number thirty-seven, all but three of which own their places of worship. The two largest Roman Catholic churches, St. Patrick's and the Church of the Immaculate Conception, are among the finest in the State. Seven railroads connect Lowell with the railroad system of the country. The benevolent institutions include a home for young women and children, and one for aged women, two orphanages and three hospitals. There are two reading-rooms, five daily newspapers, nine weeklies (two French) and five public libraries. Lowell was early famed for the high character of its operatives, who for some years published a periodical of considerable literary merit called *The Lowell Offering*, which was, it is believed, the only publication of the kind ever sustained by workpeople.

Lowell is divided into six wards, and is governed by a mayor, a board of eight aldermen, and a common council of twenty-four members.

The receipts of the city treasury for 1899 were \$3,307,154, and the expenditures \$3,238,986. The city debt, January 1, 1890, was: ordinary debt, \$1,633,700; water-works debt, \$1,828,000. The net expenditure for schools in 1899 was \$488,905, and the enrollment of pupils 16,005. The city is lighted principally by electricity, and has a splendid system of water-works and efficient fire and police departments.

LOWESTOFT, a watering-place, seaport, and market-town of Suffolk, England, is picturesquely situated on a lofty acclivity, which includes the most easterly point of land in England, twenty-three miles southeast of Norwich. Previous to the opening of a railway, it

was only a small fishing village, but since then it has risen to some importance as a seaport, while its picturesque situation, and its facilities for sea-bathing, have rendered it a favorite watering-place. The population of the urban sanitary district in 1901 was about 22,000.

LOWICZ, a town of Russian Poland, on the Bzura river, in the government of Warsaw, fifty-four miles by rail west from the capital, on the line between Skiernewice and Bromberg. Population about 8,500.

LOWTH, ROBERT, bishop of London, was born at Buriton, Hampshire, in 1710, or, according to other authorities, in the Close of Winchester. He died in 1787.

LOYALTY ISLANDS, a group in the South Pacific, about sixty miles east of New Caledonia, consisting of Uvea or Uea (the northmost), Lifu, Toka, and several small islands, and Mare or Nengone. They are coral islands of comparatively recent elevation, and in no place rise more than 250 feet above the level of the sea. Lifu, the largest, is about fifty miles in length by twenty-five in breadth. Enough of its rocky surface is covered with a thin coating of soil to enable the natives to grow yams, taro, bananas, etc., for their support; cotton thrives well, and has even been exported in small quantities, but there is no space available for its cultivation on any considerable scale. Population, 15,000.

LOYOLA, IGNATIUS DE, St. Inigo, the youngest son of Beltran de Loyola, was born in 1491 at the castle of Loyola, the family seat, situated on the river Urola, about a mile from the town of Azpeitia, in the province of Guipuzcoa, Spain. He died at Rome on July 31, 1556, was beatified by Paul V. in 1609, and canonized along with Francis Xavier by Gregory XV. on March 13, 1623, the bull being published by Urban VIII. on August 6. His festival (duplex) is observed on July 31st. (See JESUITS.)

LOZÈRE, a department of southeastern France, but belonging to the great central plateau, is composed of almost the whole of Gévaudan and of some parishes of the old dioceses of Alais and Uzès, districts all formerly included in the province of Languedoc. It is bounded on the northwest by Cantal, on the northeast by Haute-Loire, on the east by Ardèche, on the southeast by Gard, and on the southwest by Aveyron, having an extreme length of sixty-five miles, an extreme breadth of fifty, and an area of 1,996 square miles. Population (1901), 124,049.

LUBECK, a free city of Germany, situated on a gentle ridge between the rivers Trave and Wakenitz, ten miles southwest of the mouth of the former, and forty miles by rail northeast of Hamburg. Old Lübeck, the chief emporium of the Slav inhabitants of Wagria (East Holstein), stood on the left bank of the Trave, where it is joined by the river Schwartau, and was ultimately destroyed in 1138. Five years later Count Adolphus II. of Holstein founded New Lübeck, a few miles farther up, on the peninsula Buku, where the deep current of the Trave is joined on the right by the Wakenitz, the broad emissary of the Lake of Ratzeburg. A most excellent harbor, well sheltered against pirates, it became almost at once a successful competitor for the commerce of the Baltic. Its foundation coincided with the beginning of the general advance of the Low German tribes of Flanders, Friesland, and Westphalia along the southern shores of the great inland sea, the second great emigration of the colonizing Saxon element. About 1157 Henry the Lion, duke of Saxony, forced his vassal, the count of Holstein, to give up Lübeck; and in 1163 he removed thither the tottering episcopal see of Oldenburg (Stargard), founding at the same time the dioceses of Ratzeburg and Schwerin. He issued the first charter to the citizens, and deliberately constituted them a free Saxon community having

its own magistrate, an inestimable advantage over all other towns of his dominions. In the year 1201 Lübeck was conquered by Waldemar II. of Denmark, who prided himself on the possession of such a city. But in 1223 it regained its liberty, after the king had been taken captive by the count of Schwerin. In 1226 it was incorporated as an independent city of the empire by Frederick II., and took an active part with the enemies of the Danish king in the victory of Yornhövd, 1227. Though the great federal armament against Waldemar IV., the destroyer of Wisby, was decreed by the city representatives assembled at Cologne in 1367, Lübeck was the leading spirit in the war which ended with the surrender of Copenhagen and the glorious peace concluded at Stralsund on May 24, 1370.

In 1368 the seal of the city, a double-headed imperial eagle (which in the fourteenth century took the place of the more ancient ship), was expressly adopted as the common seal of the confederated towns (*civitates maritimæ*), some seventy of which had united to bear the brunt of the strife. By and by, however, toward the end of the fifteenth century, the power of the Hanseatic League began slowly to decline, owing to the rise of Burgundy in the west, of Poland and Russia in the east, and the emancipation of the Scandinavian kingdom from the fetters of the union of Calmar. Still Lübeck, even when nearly isolated, strove manfully to preserve its predominance in a war with Denmark (1501-12), supporting Gustavus Vasa in Sweden, lordling it over the north of Europe during the years 1534 and 1535 in the person of Jürgen Wullenwever, the democratic burgomaster, who professed the most advanced principles of the Reformation, and engaging with Sweden in a severe naval war (1563-70). Before the end of the century the old privileges of the London Steelyard were definitely suppressed by Elizabeth. As early as 1425 the regular shoals of herring, a constant source of early wealth, began to forsake the Baltic waters. Later on, by the discovery of a new continent, general commerce was diverted into new directions. Finally, with the Thirty Years' War, misfortunes and ruin came thick. The last Hanseatic diet met at Lübeck in 1630, shortly after Wallenstein's unsuccessful attack on Stralsund; and from that time merciless sovereign powers stopped free intercourse on all sides. Danes and Swedes battled for the possession of the Sound and its heavy dues. The often changing masters of Holstein and Lauenburg abstracted much of the valuable landed property of the city and of the chapter of Lübeck. Still, toward the end of the eighteenth century, there were signs of improvement. Though the Danes temporarily occupied the town in 1801, it preserved its freedom and gained some of the chapter lands when the imperial constitution of Germany was broken up by the Act of February 25, 1803. Trade and commerce prospered marvelously for a few years. But in November, 1806, when General Blücher, retiring from the catastrophe of Jena, had to capitulate in the vicinity of Lübeck, the town was taken and sacked by the enemy. Napoleon annexed it to the empire in December, 1810. But it rose against the French, March 19, 1813, was reoccupied by them till December 5th, and was ultimately declared a free and Hanse town of the German Confederation by the Act of Vienna, June 9, 1815. The Hanseatic League, however, having never been officially dissolved, Lübeck still enjoyed its traditional connection with Bremen and Hamburg. In 1853 they sold their common property, the London Steelyard. Till 1866 they enlisted by special contract their military contingents for the German Confederation. Down to the year 1879 they had their own court of appeal at Lübeck. The town, however, joined the Prussian Customs

Union as well as the North German Union in 1866, profiting by the final retirement from Holstein and Lauenburg of the Danes, whose interference had prevented as long as possible a direct railroad between Lübeck and Hamburg.

Lübeck through many changes in the course of eight centuries has preserved its republican government. These truly democratic institutions have been scarcely at all modified by the resuscitation of the German empire under the king of Prussia. But evidently the ancient republic has lost some important attributes of a sovereign state by giving up its own military contingent, its right of levying customs, its coinage, its postal dues, its judicature, to the new national empire. On the other hand, it has preserved its municipal self-government and its own territory, the inhabitants of which now enjoy equal political privileges with the citizens. The territory, of about five and one-half German square miles (116 English square miles), partly extends toward the mouth of the river Trave, where the borough of Travemünde has been the property of Lübeck since 1329, and partly consists of numerous villages, manors, farms, and corn, pasture, and forest lands scattered over the adjoining portions of the duchies of Holstein and Lauenburg. The manor and borough of Bergedorf on the Elbe, one and one-half German square miles, long held by Lübeck in common with Hamburg, was ceded to the latter by treaty of July 1, 1867. The lands which remain to Lübeck are thinly peopled, for according to the census of 1900, of the total of 82,098 inhabitants 40,000 lived in Lübeck itself. The vast majority, 96 per cent, are Lutheran Protestants, whose service continues in the magnificent city churches, the cathedral, 60 parishes at Travemünde, and the four country parishes.

LUBLIN, town of Russian Poland, capital of the province of same name, sixty miles southeast of Warsaw, on the Bistrzyca, a tributary of the Wieprz. Population (1890), 30,000.

LUBRICANTS are fluids which are interposed between solid machine surfaces that are required to slide on each other. The object is to lessen the friction, which is injurious both in wearing away the surfaces, and thus destroying the fit between them, and in dissipating and rendering useless part of the energy transmitted through the machine. The difference between the wear on unlubricated and that on lubricated surfaces is so serious that a comparison between the cost of lubrication and the money saving and avoidance of repairs is superfluous. But the difference in wear when two different lubricants are used is not very great and the proper choice between the two lubricants depends on a comparison of their cost with the amount of working power they save from dissipation.

LUCAN, MARCUS ANNEUS LUCANUS, the most eminent Roman poet of the silver age, grandson of the rhetorician Seneca and nephew of the philosopher, was born at Corduba, November 3, 39 A.D. His father, Lucius Anneus Mela, had amassed great wealth as imperial procurator for the province. In a memoir by an anonymous grammarian, who may have abridged Suetonius, Lucan is said to have been taken to Rome at the age of eight months, to have displayed remarkable precocity, and to have incurred the displeasure of Nero by overcoming him in a poetical contest. It is certain that Nero, whether from jealousy, as Tacitus affirms, or on account of the republican spirit of Lucan's poetry, forbade him to recite in public, and that his indignation made him an accomplice in the conspiracy of Piso, 65 A.D. Upon the discovery of the plot he is alleged to have endeavored to purchase safety by impeaching his own mother ("hoping," says his translator Gorges

quaintly, "that this impiety might be a means to procure pardon at the hands of an impious prince"). The statement, however, of Tacitus, that letters were forged in his name to implicate his father, warrants the suspicion that the evidence against his mother may also have been fabricated. Failing to obtain a reprieve, he caused his veins to be opened, and expired with great courage, repeating a passage from his *Pharsalia* descriptive of the death of a wounded soldier.

LUCANIA, in ancient geography, was the name given to a province of Southern Italy, extending from the Tyrrhenian Sea on the west to the Gulf of Tarentum on the east, while to the north it adjoined Campania, Samnium, and Apulia, and to the south was separated by a comparatively narrow isthmus from the province of Bruttium, which forms the southern extremity of Italy. It thus comprised the modern province of the Basilicata, together with the greater part of the Principato Citeriore and a small portion of Calabria. The precise limits were the river Silarus on the northwest, which separated it from Campania, and the Bradanus, which flows into the Gulf of Tarentum, on the northeast; while the two little rivers Laus and Crathis, flowing from the ridge of the Apennines to the sea on the west and east, marked the limits of the province on the side of Bruttium.

LUCARIS, CYRILLUS (c. 1572–1638). See GREEK CHURCH.

LUCAS OF LEYDEN was born about 1494, at Leyden, where his father, Hugh Jacobsz, gave him the first lessons in art. He then entered the painting-room of Cornelis Engelbrechtszen of Leyden, and soon became known for his capacity in making designs for glass, engraving copper-plates, painting pictures, portraits, and landscapes in oil and distemper. He was only fourteen when he finished a plate representing Mohammed taking the life of a friar, and at fifteen he produced a series of nine plates for a *Passion*, a *Temptation of St. Anthony*, and a *Conversion of St. Paul*. In course of time Lucas rose to more than a competence. In 1527 he made a tour of the Netherlands, giving dinners to the painters of the guilds of Middleburg, Ghent, Malines, and Antwerp. He was accompanied during the trip by Mabuse, whom he imitated in his style as well as in his love of rich costume. But festive cheer and banquets disagreed with Lucas. On his return home he fell sick, and remained ailing till his death in 1533, and when he died he did so with the firm belief that poison had been administered to him by some envious comrade.

LUCCA, a city of Northern Italy, the chief town of a province, an archiepiscopal see, and the seat of a court of assize, lies thirteen miles by rail northeast of Pisa. Population (1901) of province, 318,610; of city, 74,718.

LUCCA, BATHS OF (BAGNI DI LUCCA, formerly BAGNO A CORSENA), a commune of Italy in the province of Lucca, containing a number of famous watering-places. They are situated in the valley of the Lima, a tributary of the Serchio; and the district is known in the early history of Lucca as the Vicaria di Val di Lima. Ponte Serraglio (sixteen miles to the north of Lucca) is the principal village; but there are warm springs and baths also at Villa, Docce Bassi, Bagno Caldo, etc. The population of the commune was 15,000 in 1901.

LUCENA, a town of Spain, in the province of Cordova, thirty-seven miles south-southeast from that city, and eleven miles by road southeast from the Aguilar station of the Cordova-Málaga Railway. Population (1898), 22,000.

LUCERA, a city of Italy, in the province of Foggia, on a hill in the midst of the Apulian plain, lies ten miles west-northwest of Foggia. Although a busy and flour-

ishing place, with 14,014 inhabitants, Lucera is mainly of historical interest.

LUCERNE (German, *Luzern*), a canton of Switzerland, lying northwest of the central mass of the Swiss Alps, having the canton of Aargau to the north, Bern to the west and south, and the small cantons of Zug, Schwyz, and Unterwalden on the east and southeast sides. Like most of the Swiss cantons, its form is very irregular, and it includes, besides a part of the Lake of Lucerne, the lakes of Sempach and Baldegg, and several smaller sheets of water. To this circumstance is probably due the discrepancy in the various estimates of the area, which range from 498 to 579 square miles. The greater part of its territory lies in the low, hilly region of northwestern Switzerland, most of which is under cultivation; but it has one considerable valley, the Entlebuch, inclosed by mountains, several of which exceed 5,000 feet in height, which is devoted to pasturage. The population in December, 1901, was 146,159, of whom all but 5,634 were Roman Catholics. The language is exclusively German, and the people belong to the Teutonic stock.

LUCERNE, the chief town of the Swiss canton of that name, stands on both banks of the Reuss, where that river issues from the northwest end of the chief arm of the lake of Lucerne. The position of the town is singularly beautiful. Beyond the lower hills, rich with planting and cultivation, which slope toward the shores of the lake and the river, loftier summits of very varied form rise in the background. Most prominent of these is the many-peaked Pilatus, only about seven miles distant, while the double summit of the Mythen, at the opposite end of the lake, is flanked by other less imposing summits, among which the Righi draws attention, owing to the fame of its panoramic view. The town appears to owe its origin to a Benedictine monastery which stood on the site of the present Hofkirche. The buildings which clustered round gradually increased, until, early in the fourteenth century, the walls were erected for protection, and bridges were carried across the river. The Rathhaus, which is the seat of the cantonal government, is an ancient building adorned with wood carving and quaint pictures. In a large hall are preserved the portraits of the chief magistrates from the earliest times to the year 1814. The libraries of Lucerne are said to possess the most complete and important collection of documents connected with the history of Switzerland during the Middle Ages. The town library, now in the museum, contains about 12,000 volumes, and is especially rich in manuscript chronicles. The cantonal library, reckoned at over 80,000 volumes, with many incunabula, was chiefly formed from the libraries of suppressed monasteries. Population (1901), 29,633.

LUCERNE, LAKE OF, the name given by foreigners to the Vierwaldstättersee, or lake of the four forest cantons of Switzerland. Only a small portion of its shores lie within the canton of Lucerne, but the name has been taken from the most considerable town which it approaches. Lying on the northwest side of the Alps of central Switzerland, this lake has extraordinary interest for the physical geographer, for the lover of natural scenery, and for all who feel sympathy with the story of Swiss independence. Like most of the other Alpine lakes, it lies altogether among the *Voralpen*, or outer ranges of the Alps, but is remarkable for the extreme irregularity of its form, which suggests problems of much difficulty to the orographer. Lucerne is the only town on the lake. Altdorf, the chief town of Uri, stands nearly two miles from the head of the Bay of Uri, and Schwyz, capital of the canton of that name, is more than three miles from the shore; but since the introduction of steam navigation several of

the villages on its coast have largely increased in population.

Modern skepticism has thrown doubt upon many of the details in the popular history of the origin of Swiss independence; but it is certain that the shores of this lake nurtured the men who commenced the heroic efforts that secured freedom for their country. Here, at the beginning of the fourteenth century, in an age when nearly all Europe was in the hands of feudal oppressors, a handful of mountaineers drove out the local tyrants and leveled their strongholds, and a few years later, on the fields of Morgarten and Sempach, confronted and put to flight the chivalry of Austria.

LUCIA, or LUCY, St., was a noble Christian virgin of Syracuse, who lived in the reign of Diocletian. Her mother, having been miraculously cured of an illness at the sepulcher of St. Agatha in Catania, was persuaded by Lucia to distribute all her wealth to the poor. The youth to whom the daughter had been betrothed forthwith denounced her to Paschasius the prefect, who ordered that she should be taken away and subjected to shameful outrage. But it was found that no force which could be applied was able to move her from the spot on which she stood; even boiling oil and burning pitch had no power to hurt her, until at last she was slain with the sword. Such in substance is the narrative of the appropriate lessons given in the Roman Breviary for the festival of St. Lucia on December 13th.

LUCIAN, one of the principal essay-writers and satirists of the post-Christian era, the silver age of Greek literature, was born at Samosata on the Euphrates in northern Syria. We have no indication of the precise date of his birth, but it is probable that he flourished about or after the middle of the second century, as he mentions Marcus Aurelius and his war with the German Marcomanni and Quadi (170-74 A.D.) in his *Alexander*. In the *Philopatri*s, though the dialogue so-called is generally regarded as spurious, there is a statement of the doctrine of the Trinity, and the "Galilaean who had ascended to the third heaven" and "renewed" by the waters of baptism, may possibly allude to St. Paul.

As a satirist and a wit Lucian stands without a rival. In these respects he may be said to occupy in prose literature the unique position which Aristophanes holds in Greek poetry.

As a writer Lucian is fluent, easy, and unaffected, and a close follower of the best Attic models, such as Plato and the orators. It is a well-merited praise of the author to say that to a good Greek scholar the pages of Lucian are almost as easy and as entertaining as an English or French novel.

LUCIAN, the martyr, was born, like the famous heathen writer of the same name, at Samosata. His parents, who were Christians, died when he was in his twelfth year. In his youth he studied under Macarius of Edessa, and after receiving baptism he adopted a strictly ascetic life, and devoted himself with zeal to the continual study of Scripture. Settling at Antioch, he became a presbyter, and, while supporting himself by his skill as a swift writer, became celebrated as a teacher, pupils crowding to him from all quarters, so that he is regarded as the founder of the famous theological school of Antioch. He did not escape suspicion of heresy, and is represented as the connecting link between Paul of Samosata and Arius. Indeed, on the deposition of the former, he was excluded from ecclesiastical fellowship by three successive bishops of Antioch, while the latter seems to have been among his pupils. He was, however, restored before the outbreak of persecution, and the reputation won by his high character and learning was confirmed by his courageous martyr-

dom. He was carried to Nicomedia, before the cruel Maximin, and persisting in his faith perished in 312 A.D., under torture and hunger, which he refused to satisfy with food offered to idols.

LUCIFER, bishop of Cagliari (hence called *Calaritanus* or rather *Caralitanus*), an ardent supporter of the cause of Athanasius, after the unfavorable result of the synod of Arles in 353 volunteered to go to the court and endeavor to obtain a new and impartial council; he was accordingly sent by Pope Liberius, along with Pancratius the presbyter and Hilarius the deacon, but did not succeed in preventing the condemnation of Athanasius, which was renewed at Milan in 355. For his own persistent adherence to the orthodox creed he was banished to Germanicia in Commagene; he afterward lived at Eleutheropolis in Palestine, and finally in the upper Thebaid. His exile came to an end with the publication of Julian's edict in 362.

LUCILIUS. Among the early Roman poets, of whose writings only fragments have been preserved, Lucilius was second in importance to Ennius. If he did not, like the epic poet of the republic, touch the imagination of his countrymen, and give expression to their highest ideal of national life, he exactly hit their ordinary mood, and expressed the energetic, critical and combative temper which they carried into political and social life. He was thus regarded as the most genuine literary representative of the pure Roman spirit. The reputation which he enjoyed in the best ages of Roman literature is proved by the terms in which Cicero and Horace speak of him. Persius, Juvenal, and Quintilian vouch for the admiration with which he was regarded in the first century of the empire. The popularity which he enjoyed in his own time is attested by the fact that at his death in 102 B.C., although he had filled none of the offices of state, he received the honor of a public funeral.

The dates assigned by Jerome for his birth and death are 148 and 103 or 102 B.C. But it is impossible to reconcile the first of these dates with other facts recorded of him. We learn from Velleius that he served under Scipio at the siege of Numantia in the year 134 B.C. We learn from Horace that he lived on the most intimate terms of friendship with Scipio and Lælius, and that he celebrated the exploits and virtues of the former in his satires.

LUCIUS, the name of three popes.

LUCIUS I., whose pontificate of about eight months (253-54) fell between those of Cornelius and Stephen I., had been one of the presbyters who accompanied Cornelius when he withdrew from Rome. Like all the early popes he has been canonized in the Church of Rome; and he is commemorated as a martyr on March 4th.

LUCIUS II. (Gherardo de Caccianimici), a Bolognese, succeeded Celestine II. on March 4, 1144. Soon after his accession the people of Rome chose a patrician, for whom they claimed the temporal sovereignty; Lucius at the head of the oligarchical party appealed to arms, and perished in an attempt to storm the Capitol on February 25, 1145. He was succeeded by Eugenius III.

LUCIUS III. (Ubaldo Allucingoli), a native of Lucca, was bishop of Ostia and Velletri when he was chosen to succeed Alexander III. on September 1, 1181. For six months he lived at Rome; but in March, 1182, he was driven forth by rebellion, and resumed his abode at Velletri; he afterward lived at Anagni, and finally at Verona. While at the last-named place he pronounced sentence of excommunication against the Cathari, Paterines, Humiliati, Waldensians, and Arnoldists in 1184; but "left the papal thunders to their own unaided effects." He died at Verona on November 25, 1185, and was succeeded by Urban III.

LÜCKE, GOTTFRIED CHRISTIAN FRIEDRICH, the-ologist, was born at Egeln, near Magdeburg, Germany, in 1791, and died in 1855.

LUCKENWALDE, a town of Prussia, in the province of Brandenburg, district of Potsdam, lies on the river Nuthe and on the Berlin and Anhalt Railway, thirty miles to the southwest of Berlin. Its cloth and wool manufactories are among the most extensive in Prussia, and it also contains cotton-printing works, dye-works, machine-shops, and numerous other industrial establishments. The population is 14,706.

LUCKNOW, a district of Oudh, in the division or commissionership of Lucknow, under the jurisdiction of the lieutenant-governor of the Northwestern Provinces, India. Population (1901), 800,000.

LUCKNOW, capital of the above district, and of the province of Oudh, is distant from Cawnpur forty-two miles, from Benares 199 miles, and from Calcutta 610 miles, and has an area of thirteen square miles. It ranks fourth in size among Indian cities, being only surpassed by the presidency capitals of Calcutta, Madras, and Bombay. It stands on both banks of the Gumti, mostly on the western side, the river being spanned by four bridges, two of them built by native rulers and two since the British annexation in 1856. Viewed from a distance, the city presents a picture of unusual magnificence and architectural splendor, which fades on nearer view into something more like the ordinary aspect of a crowded Oriental town. Pop. (1901), 263,951.

The most interesting event in the modern history of Lucknow is the siege during the mutiny of 1857-58. Symptoms of disaffection occurred as early as April, 1857, and Sir Henry Lawrence immediately took steps to meet the danger by fortifying the residency and accumulating stores. On the night of May 30th, the expected insurrection broke out; the men of the 71st regiment of native infantry, with a few from the other regiments, began to burn the bungalows of their officers, and to murder the inmates, but were dispersed by the European force and fled toward Sitapur. Though the city thus remained in the hands of the British, the symptoms of disaffection among the remaining troops were unmistakable, and on June 11th the military police and native cavalry broke into open revolt, followed on the succeeding morning by the native infantry. On the 20th news of the fall of Cawnpur arrived; and on the 29th occurred the failure of Lawrence's attack upon the advancing enemy, in consequence of which the British troops fell back on Lucknow, abandoned the Machi Bhawan, and concentrated all their strength on the residency. The siege of the inclosure began upon July 1st. Three unsuccessful assaults were made by the mutineers on July 20th, August 10th, and August 18th; but meanwhile the British within were dwindling away. On September 5th news of the relieving force under Outram and Havelock reached the garrison, and on the 22d the relief arrived at the Alambagh, a walled garden on the Cawnpur road held by the enemy in force. Havelock stormed the Alambagh, and on the 25th fought his way with continuous opposition through the narrow lanes of the city. On the 26th he arrived at the gate of the residency inclosure, and was welcomed by the gallant defenders within. The sufferings of the besieged had been very great; but even after the first relief it became clear that Lucknow could only be temporarily defended till the arrival of further reinforcements should allow the garrison to cut its way out. Night and day the enemy kept up a continual firing against the British position, while Outram, who had reassumed the command which he yielded to Havelock during the relief, retaliated by frequent sorties. Throughout October the garrison continued its gallant defense, and a small party, shut up

in the Alambágh, and cut off unexpectedly from the main body, also contrived to hold good its dangerous post. Meanwhile Sir Colin Campbell's force had advanced from Cawnpur, and arrived at the Alambágh on November 10th. The Alambágh, the Dilkusha palace, southeast of the town, the Martinière, and the Sikandra Bágh, the chief rebel stronghold, were successively carried in the course of the six following days, and the second relief was successfully accomplished. Even now, however, it remained impossible to hold Lucknow, and Sir Colin Campbell determined, before undertaking any further offensive operations, to return to Cawnpur with his army, escorting the civilians, ladies, and children rescued from their long imprisonment in the residency, with the view of forwarding them to Calcutta. On the morning of November 20th, the troops received orders to march for the Alambágh; and the residency, the scene of so long and stirring a defense, was abandoned for a while to the rebel army. Outram with 3,500 men held the Alambágh until the commander-in-chief could return to recapture the capital. The rebels in great strength again surrounded the greater part of the city, for a circuit of twenty miles, with an external line of defense. On March 2, 1858, Sir Colin Campbell found himself free enough in the rear to march once more upon Lucknow. He first occupied the Dilkusha, and posted guns to command the Martinière. On the 5th Brigadier Franks arrived with 6,000 men; Outram's force then crossed the Gumti, and advanced from the direction of Faizábád, while the main body attacked from the southeast. After a week's hard fighting, March 9-15, the rebels were completely defeated, and their posts captured one by one.

LUCRETIVS (T. LUCRETIVS CARUS), more than any of the great Roman writers, has acquired a new interest in the present day. This result is due, not so much to a truer perception of the force and purity of his style, of the majesty and pathos of his poetry, or of the great sincerity of his nature, as to the recognition of the relation of his subject to many of the questions on which speculative curiosity is now engaged. It would be misleading to speak of him, or of the Greek philosophers whose tenets he expounds, as anticipating the more advanced scientific hypotheses of modern times. But it is in his poem that we find the most complete account of the chief effort of the ancient mind to explain the beginning of things, and to understand the course of nature and man's relation to it. Physical philosophy in the present day is occupied with the same problems as those which are discussed in the first two books of the *De Rerum Natura*. The renewed curiosity as to the origin of life, the primitive condition of man, and his progressive advance to civilization finds an attraction in the treatment of the same subjects in the fifth book. The old war between science and theology, which has been revived in the present generation, is fought, though with different weapons, yet in the same ardent and uncompromising spirit throughout the whole poem, as it is in the writings of living thinkers. There is no ancient poet, with the exception of Homer, of whose history so little is positively known.

Our sole information concerning his life is found in the brief summary of Jerome, written more than four centuries after the poet's death. Scholars are now agreed that in these summaries, added to the translation of the Eusebian Chronicle, Jerome followed, often carelessly and inaccurately, the accounts contained in the lost work of Suetonius *De Viris Illustribus*. But that work was written about two centuries after the death of Lucretius; and, although it is likely that Suetonius used the information transmitted by earlier grammarians, there is nothing to guide us to the original

sources from which the tradition concerning the life of Lucretius was derived. The strange character of the story which has been transmitted to us, and the want of any support to it from external evidence, oblige us to receive it with a certain reserve.

According to this account the poet was born in the year 94 B.C.; he became mad in consequence of the administration of a love-philter; and after composing several books in his lucid intervals, which were subsequently corrected by Cicero, he died by his own hand in the forty-fourth year of his age.

LUCULLUS. The Luculli appear in Roman history shortly after the close of the second Punic war. They belonged to the Licinian "gens," a plebeian house which became noted for its special ability in amassing wealth. By far the most famous of its members was Lucius Licinius Lucullus, surnamed Ponticus from his victorious campaigns in Asia Minor against one of the most formidable enemies Rome ever encountered, the great Mithridates, king of Pontus. His father had held an important military command in Sicily, but on his return to Rome he was considered to have acquitted himself so discreditably that he was prosecuted on a charge of bribery and corrupt practices, and was condemned to exile. His mother was Cæcilia, of the family of the Metelli, and was the sister of the distinguished Metellus Numidicus. The career of Lucullus coincides with the first half of the first century B.C. It appears that he was rather senior to Pompey, who was born in 106 B.C. We hear of him when quite a young man as making a determined though unsuccessful attempt to avenge his father's downfall on the author of the prosecution, and this won him credit and popularity. Early in life he attached himself to the party of Sulla, and to that party he remained constant to his life's end. Sulla's favorable notice was secured by good military service in the so-called Social War, which finally completed the subjugation of Rome's Italian allies and in fact of the whole peninsula. In 88 B.C. came the great Mithridatic war in the East, with the direction of which Sulla was charged. In that year the young Lucullus went with him as his quæstor to Greece and Asia Minor, and, while Sulla was besieging Athens, he raised a fleet and drove Mithridates out of the Mediterranean. He won a brilliant victory off Tenedos, and it seems probable that, had he been as faithful to Rome as he was to Sulla and his party, he might have ended a perilous war. But, like many of his contemporaries, Lucullus was too much of a party man to be a genuine patriot.

In 84 B.C. peace was concluded with Mithridates, and the great king had to cede the Greek islands and a large part of his Asiatic possessions, and was practically reduced to the position of a mere Roman dependent. Sulla returned to Rome, while Lucullus remained in Asia, and by a series of wise and generous financial reforms laid the foundation of the future wealth and prosperity of the province. He was in Asia till 80 B.C., and then returned to Rome as curule ædile, in which capacity he exhibited together with his colleague, his brother Marcus, games which were long remembered by the citizens of Rome for their exceptional magnificence. We may infer that thus early in life he had found the means of acquiring an immense fortune, which throughout his whole career it was his delight lavishly to display. Soon afterward he was elected prætor, and was next appointed to the province of Africa, where again he won a good name as a just and considerate governor. In the year 74 B.C. he became consul, with Aurelius Cotta as his colleague. An attempt was made at this time by a leader of the democratic party to repeal the legislation of Sulla, and its failure appears to have been mainly due to the strenuous efforts of Lucullus.

The East was now again unsettled, and Bithynia, which had been bequeathed to Rome by its king Nicomedes, was threatened by Mithridates. The new province with the command of the fleet fell to Cotta, but Lucullus was called to lead the armies of Rome against this dangerous enemy. In 74 B.C. he was in Asia at the head of a force of about 30,000 foot and 2,000 horse. The king of Pontus was already on Roman ground in Bithynia, and Cotta was shut up in Chalcedon on the Propontis by a vast host of 150,000 men. The enemy's fleet had forced its way into the harbor, and had burnt all the Roman vessels lying at anchor. The advance of Lucullus, however, forced the king to raise the siege and retire along the sea-coast, till he halted before the strong city of Cyzicus, the key of Asia, as it was called, built on an island at a little distance from the mainland, with which it was connected by a bridge. In the autumn of 73 B.C., Lucullus pushed into the heart of Pontus far beyond the Halys, the limit of the famous Scipio's advance eastward, and continued his onward march, regardless of the murmurs of his weary soldiery, to Cabeira or Neocesarea (now Niksar), where the king had gone into winter quarters with a vague hope that his son-in-law, Tigranes, the powerful king of Armenia, and possibly even the Parthians, might, for their own sakes, come to his aid against a common foe. It was by a very toilsome march through difficult roads that the Roman army at last reached Cabeira, to find themselves confronted by a greatly superior force. But the troops of Mithridates were no more a match for the Roman legionaries than were the Persians for Alexander, and a large detachment of his army was decisively cut up by one of Lucullus' lieutenant-generals. The king decided on instant retreat, but the retreat soon became a disorderly flight, and Lucullus, seizing the moment for attack, annihilated his enemy, Mithridates himself escaping with difficulty over the mountain range between Pontus and Cappadocia into Lesser Armenia. He found a sort of refuge in the dominions of Tigranes, but he was in fact detained as a prisoner rather than received as an honored friend and ally.

Pontus thus, with the exception of some of the maritime cities, such as Sinope, Heraclea, and Amisus, which still clung to the king under whom they had enjoyed a free Greek constitution, became Roman territory. Two years were occupied in the siege and capture of these strongholds, while Lucullus busied himself with a general reform of the administration of the province of Asia. His next step was to demand the surrender of Mithridates and to threaten Tigranes with war in the event of refusal. In the spring of the year 69 B.C., at the head of only two legions, which, it appears, by no means liked the hardships of the expedition, he marched through Sophene, the southwestern portion of Armenia, crossed the Tigris, and pushed on to the newly-built royal city, Tigranocerta, situated on one of the affluents of that river. A motley host, made up out of the tribes bordering on the Black Sea and the Caspian, hovered round his small army, but failed to hinder him from laying siege to the town. On this occasion Lucullus showed consummate military capacity, contriving to maintain the siege and at the same time to give battle to the enemy with a force which must have been inferior in the ratio of something like one to twenty. According to his own account he put the Armenians to rout with a loss of five Roman soldiers, leaving 100,000 dead on the field of battle. The victory before the walls of Tigranocerta was undoubtedly a very glorious one for the arms of Rome, and it resulted in the dissolution of the Armenian king's extensive empire. There might now have been peace but for the interference of Mithridates, who for his own sake

pressed Tigranes to renew the war and to seek the aid and alliance of Parthia. The Parthian king, however, was disposed to prefer a treaty with Rome to a treaty with Armenia, and desired simply to have the Euphrates recognized as his western boundary. Mithridates next appealed to the national spirit of the peoples of the East generally, and endeavored to rouse them to a united effort against Roman aggression. He hoped to crush his enemy amid the mountains of Armenia, and indeed the position of Lucullus was highly critical. The home government was for recalling him, and seemed to think little of his splendid successes; and his little army, which one might have supposed would have been proud of its general, was on the verge of mutiny. The vexation of his troops broke out into an open mutiny, which compelled him to recross the Tigris into the Mesopotamian valley. Here he surprised and stormed Nisibis, the capital of the Armenian district of Mesopotamia, and in this city, which yielded him a rich booty, he found satisfactory winter quarters.

Meantime Mithridates was again in Pontus, and the Roman forces which had been left there were soon overwhelmed. In one disastrous engagement at Zicla the Roman camp was taken and the army slaughtered to a man. The work of eight years of war was undone. Commissioners sent from Rome to settle the affairs of the East had to report to the senate that a large part of Asia Minor was in the enemy's hands. In the year 66 B.C. Lucullus was recalled, and superseded in his command by Pompey.

He had indeed earned by his brilliant victories the honor of a triumph, but he had powerful enemies at Rome, and charges of maladministration, to which no doubt his immense wealth gave no unreasonable color, caused it to be deferred for three years. In 63 B.C., however, it was celebrated with extraordinary magnificence.

His name calls up before the mind visions of boundless luxury and magnificence, and among the Roman nobles who reveled in the newly acquired riches of the East, Lucullus, it is certain, stood preëminent. His park and pleasure grounds in the immediate vicinity of the capital were the wonder and admiration of his own and of the succeeding age. Pompey is said to have styled him the Roman Xerxes, in allusion, not only to his splendor, but also to the costly and laborious work to be seen in his parks and villas at Tusculum, near Naples, where rocks and hills had been pierced at an almost infinite expense. On one of his luxurious entertainments he is said to have spent upward of \$10,000. Far the most pleasing trait in his character is the liberal patronage which he gave more especially to Greek philosophers and men of letters, and the fact that he collected a vast and valuable library, to which such men had free access. On the whole we may take Lucullus to have been a man who in many respects rose above his age, and was a decidedly favorable specimen of a great Roman noble.

Of his latter years but little is recorded. He had, as we have seen, almost wholly retired from public life. It appears that he sank into a condition of mental feebleness and imbecility some years before his death, and was obliged to surrender the management of his affairs to his brother Marcus. The usual funeral panegyric was pronounced on him in the Forum, and the people would have had him buried by the side of the great Sulla in the Campus Martius, but he was laid at his brother's special request in his splendid villa at Tusculum.

LUDDITES, THE, were organized bands of rioters for the destruction of machinery, who made their first appearance in Nottingham and the neighboring midland districts of England about the end of 1811. In 1779 there lived

in a village in Leicestershire a person of weak intellect, called Ned Lud, who was the butt of the boys of the village. On one occasion Lud pursued one of his tormentors into a house where were two of the frames used in the stocking manufacture, and, not being able to catch the boy, vented his anger on the frames. Afterward, whenever any frames were broken, it became a common saying that Lud had done it. It is curious also that the leader of the riotous bands took the name of General Lud. The Luddite riots arose out of the severe distress caused by commercial depression and the consequent want of employment. They were specially directed against machinery because of the widespread prejudice that its use directly operated in producing a scarcity of labor. The riots began at Nottingham in November, 1811, with the destruction of stocking and lace frames, and, continuing through the winter and following spring, spread into Yorkshire and Lancashire. They were met by severe repressive legislation—a notable feature in the opposition to it being Lord Byron's speech in the House of Lords, the first which he delivered there. In 1816 the rioting was resumed, through the fearful depression that followed on the European peace, aggravated by one of the worst of recorded harvests, when the corn was still green in October, and the potato crop was a failure. In that year, though the center of the rioting was again in Nottingham, it extended over almost the whole kingdom, and took more decidedly the form of a general discontent and seditious restlessness. The rioters were also thoroughly organized. While part of the band with extraordinary quickness and thoroughness destroyed the machinery in the houses, sentinels were posted to give warning of the approach of the military and police; and all had generally disappeared before the least risk of discovery. Under the influence of vigorous repressive measures, and especially of reviving prosperity, the spirit of rioting ere long died out.

LUDHIANA, a district in the lieutenant-governorship of the Punjab, India. The census of 1898 returned a total population of 583,245 persons (319,342 males and 263,903 females), spread over an area of 1,359 square miles.

LUDHIANA, the chief town and headquarters station of Ludhiāna district, is situated on the south bank of the old bed of the Sutlej, eight miles from the present bed of the river. The population is 39,983.

LUDINGTON, the capital of Mason county, Mich., is situated on Lake Michigan at the mouth of the Marquette river, fifty-four miles from Muskegon. Lumber is its chief article of export, and it contains several mills for the manufacture of shingles. It possesses good railroad and telegraph facilities, two banks, and many stores. Population (1900), 7,166.

LUDLOW, a municipal and parliamentary borough and market-town of Shropshire, England, is situated at the junction of the Teme and Corve on the borders of Herefordshire, twenty-seven miles southeast from Shrewsbury and ten north from Leominster. Population (1901), about 8,500.

LUDLOW, EDMUND, was born at Maiden Bradley, Wiltshire, England, in 1620. He studied at Trinity College, Oxford (when he took his B. A. degree in 1636), and at the Temple. When the war broke out he engaged as a volunteer in the life guard of Lord Essex, consisting of one hundred gentlemen. He was made governor of Wardour Castle in 1643, which place he surrendered on honorable terms after ten months' siege. He was present at the second battle of Newbury, October, 1644. In 1645 he was elected M. P. for Wilts, in the room of his father Sir Henry Ludlow, and attached himself inflexibly to the republican party. In

1648 he was one of a committee of six who arranged the violent action known as Pride's Purge. He was one of the king's judges, and put his hand to the warrant for his execution. In January, 1651, Ludlow was sent into Ireland as lieutenant-general of horse, holding also a civil commission. Here he spared neither health nor money in the public service. Ireton, the deputy of Ireland, died November 27, 1651, and for six months Ludlow held the chief place, which he then resigned to Fleetwood. Though disapproving of Cromwell's action in dissolving the Long Parliament, he maintained his employment, but when Cromwell was declared Protector he declined to acknowledge his authority, and was soon after recalled to England. He refused the Protector face to face when ordered to submit to his government, and in December, 1655, retired to his own house in Essex. After Oliver Cromwell's death, Ludlow was returned for the borough of Hindon, and took his seat in Richard's parliament in 1659. He sat also in the restored Rump, and was a member of its council of state and of the committee of safety after its second expulsion. He also held office for a short time in Ireland. After the Restoration, finding that his life was in danger, he left England, in September, 1660, and traveled through France and Geneva, and thence to Vevey, then under the protection of the canton of Bern. There he spent the rest of his life unmolested, to the great credit of the government of that canton, which had also extended its protection to other regicides. He died in 1693.

LUDOLF, or **LEUTHOLF**, **HIOB**, a learned Orientalist, was born at Erfurt, Germany, in 1624; died in 1704.

LUDWIGSBURG, a second royal residence of Würtemberg, is situated nine miles to the north of Stuttgart and one and a half miles from the Neckar. It was laid out at the beginning of last century by Duke Eberhard Ludwig as a rival to Stuttgart, and was greatly enlarged by Duke Charles, who resided there from 1764 to 1785.

LUDWIGSHAFEN. See **MANNHEIM**.

LUGANO, a town of Switzerland, which divides with Locarno and Bellinzona the first rank in the canton of Tessin (Ticino). It stands on the shore of the lake of the same name, on a narrow strip of Swiss territory, which projects into Lombardy and is close to the Italian frontier.

LUGANO, LAKE OF (sometimes called *Lago Ceresio* by the Italians, from the Roman name *Lacus Ceresius*), situated partly in Lombardy and partly in the Swiss Canton Tessin or Ticino, takes its ordinary name from the town of Lugano, the only considerable place on its banks.

LUGANSK, a town of Russia, in the government of Ekaterinoslaff, district of Slavianskerbsk, 300 miles to the eastward of the capital of the province, is connected by a branch with the railway between Kharkoff and Azoff, as well as with other towns and iron-works of the Donetz coal-mines district. It stands on the small river Lugan, ten miles from its junction with the northern Donetz, in the Lugan mine district, of which it is the chief town. Population about 13,000.

LUGO, a maritime province of Spain, one of the four into which Galicia has since 1833 been divided, is bounded on the east by Oviedo and Leon, on the south by Orense, on the west by Pontevedra and Coruña, and on the north by the Atlantic. Its extreme length from north to south is about ninety-eight miles, its breadth fifty-eight, and the area 3,787 square miles. Population (1898), 459,119.

LUGO, the capital of the above province, stands on a small hill near the northern bank of the river Miño, sixty miles southwest from Coruña, and 353 northwest from Madrid, on the highway between these two cities. Population, 22,000.

LUGOS, a market-town of Hungary, capital of the trans-Tisian county of Krassó, is situated on the Temes, and on the railway from Temesvár to Karánsebes, thirty-two miles east-southeast of the former. Population, 11,287.

LUINI, BERNARDINO, the most celebrated master of the Lombard school of painting, founded upon the style of Leonardo da Vinci, was born at Luino, a village on the Lago Maggiore, toward 1465. He himself wrote his name as "Bernardin Lovino," but the spelling "Luini" is now very generally adopted. Few facts are known regarding the life of this illustrious and delightful painter, and it is only since a comparatively recent date that he has even been credited with the production of his own works, and with the fame thereto appertaining, as many of them had, in the lapse of years and laxity of attribution, got assigned to Leonardo. Bernardino, who hardly ever left Lombardy, had some merit as a poet, and is said to have composed a treatise on painting. The precise date of his death is unknown; he may, perhaps, have survived till about 1540.

LUKE, whose name is traditionally attached to the Third Gospel, appears to have been one of the companions of Paul, being mentioned as such in Col. iv. 14, Phil. 24, and 2 Tim. iv. 11; even if, as some critics suppose, these epistles were not written by Paul himself, they are at any rate likely to have preserved the local coloring. Assuming, as is probable, that the same person is intended in all three passages, we gather (1) that Luke was not a born Jew, since in Col. iv. 11, "those who are of the circumcision" appear to be separated from those, among whom is Luke, who are mentioned afterward (but there is nothing to determine the question, which has since been raised, whether he had been a Jewish proselyte or a Gentile), and (2) that he was a physician. There was an early belief, first mentioned by Irenæus, that he is spoken of, though not mentioned by name, in 2 Cor. viii. 18, as "the brother whose praise is in the gospel throughout all the churches;" and the subscription of that epistle in some MSS., and in the Peschito and other versions, embodies this belief. Of his birth and country nothing is positively known; but it is a possible inference from his name *Lucas*, which is a contraction of *Lucanus* (the full form occurs in some early MSS. of the Itala), that he was of Italian (Lucanian) descent.

From the time of Irenæus, whose testimony is soon followed by that of Clement of Alexandria, Tertullian, and Origen, this companion of Paul has generally been considered to be the author of the third canonical Gospel and of the Acts of the Apostles; but no other facts are mentioned by early writers as to his personal history, except such as may be gathered from the writings which are attributed to him.

LUKE, GOSPEL OF. See **GOSPELS**.

LUKOW, a town of Russian Poland, in the province of Siedlce, sixty miles by rail to the west of Brest-Litovsk. Owing to its situation on the railway and in the center of a rich district, it is rapidly developing. The population is 11,050.

LUKOYANOFF, a district town in Russia, in the government of Nijni-Novgorod, 108 miles south-southeast of the chief town of the government, on the highway to Saratoff, at the sources of the Tesha river, tributary of the Oka. It is situated in a district where agriculture is carried on to a large extent, corn being sold to distilleries, and hemp exported, while the extensive forests furnish materials for the production of wooden wares. Population, 10,000.

LULLY, GIOVANNI BATTISTA, was born in Florence, in 1633, and joined, in 1650, as a violinist, the orchestra of the French court. Though friendless and

in a foreign country, his genius soon opened for him a road to honors and wealth. He was appointed director of music to King Louis XIV., and director of the Paris opera. His *Miserere*, written for the funeral of the minister Sequier, is a splendid work of genius; and very remarkable are also his minor sacred compositions. On his deathbed, in 1687, he wrote *Bisogna morire, peccatore*. Lully's right to be numbered among the most original and the best musicians is undoubted.

LULLY, RAYMOND, the inventor of a fantastic system of logic by which Mohammedans should be converted to Christianity, was born at Palma, in the island of Majorca, in 1235. He married, but, notwithstanding, sought the reputation of a gallant, and was mixed up in more than one intrigue. Something, however, of the nature of a cancer, which attacked one of the objects of his passion, Signora Ambrosia—such is the way in which we are asked to account for his "conversion"—affected him so deeply that he abandoned in his thirty-second year his licentious life, and, having distributed the greater portion of his goods to his family and the poor, he withdrew to the retirement of a cell on Mount Randa, the only part of his property which he had reserved for himself. Visions of a crucified Savior and like phenomena confirmed him in his devotion to the cause of Christ, and in the course of a nine years' retreat on Randa he came to regard himself as commissioned by God to refute the errors of Mohammed.

In 1286 he began a series of visits which he made to Rome to induce the supreme pontiff to found colleges for the study of Arabic; but the small success which would attend his efforts in this direction was foreshadowed by the death of Honorius (then pope) before he could attain an audience with him. Meanwhile Lully had become discontented with the methods of science commonly in use, and had set himself to construct his "great art," a method which, by mechanically presenting all the predicates which could attach to any subject, was adapted to answer any question on any topic, and would (its author imagined) by the cogency of its inferences necessarily convert the heathen. At Tunis his attacks upon the religion of the country led to his being cast into prison, and it was only by the mediation of a sheikh, who had been impressed by the earnestness of the Christian preacher, that he managed to escape to sea, not without the roughest treatment at the hands of the mob, and find his way to Naples.

A new influence was brought to bear on Lully's life at Naples. He made the acquaintance of the alchemist Arnaud de Villeneuve, and acquired, we may believe, that skill in transmuting metals for which Lully himself became in popular tradition famous. From Cyprus Lully proceeded (1306) to Boughia in Africa, and repeated the experiences he had already had at Tunis. But, though Mohammedanism showed little disposition to welcome the "great art" and its author, the European world had meanwhile begun to show itself more favorably disposed toward Lully's projects. In 1297 he had received at Montpellier, from the general of the Franciscans, letters recommending him to the superiors of all Franciscan houses; and in 1309 his "art" was publicly approved by a decree of the university of Paris. He sailed again for Africa, and received the martyr's crown, which would seem to have become the ambition of his life. At Boughia he again proclaimed the doctrines of the church, and his preaching raised such a tumultuous attack that, although he managed to get on board a Genoese vessel, he succumbed during the voyage to the injuries he had received, and died in sight of his native town of Palma (1315).

LUMBAGO, a term in medicine applied to a painful ailment affecting the muscles of the lower part of the

back, generally regarded as of rheumatic origin. An attack of lumbago may occur alone, or be associated with rheumatism in other parts of the body at the time. It usually comes on by a seizure, often sudden, of pain in one or both sides of the small of the back, of a severe cutting or stabbing character, greatly aggravated on movement of the body, especially in attempting to rise from the recumbent posture, and also in the acts of drawing a deep breath, coughing, or sneezing. So intense is the suffering that it is apt to suggest the existence of inflammation in some of the neighboring internal organs, such as the kidneys, bowels, etc., but the absence of the symptoms specially characteristic of these latter complaints, or of any great constitutional disturbance beyond the pain, renders the diagnosis a matter of no great difficulty. Lumbago seems to be brought on by exposure to cold and damp, and by the other exciting causes of rheumatism. Sometimes it follows a strain of the muscles of the loins. The attack is in general of short duration, but occasionally it continues for a long time, not in such an acute form as at first, but rather as a feeling of soreness and stiffness on movement. The treatment includes that for rheumatic affections in general (see RHEUMATISM) and the application of local remedies to allay the severe pain.

LUMP-SUCKER, or **LUMP-FISH** (*Cyclopterus lumpus*), a marine fish which with another genus (*Liparis*) forms a small family (*Discoboli*) closely allied to the Gobies (see GOBY). Like many fishes of the latter family, the lump-suckers have the ventral fins united into a circular concave disk, which, acting as a sucker, enables them to attach themselves firmly to rocks or stones. The body of the lump-sucker (properly so called) is short and thick, with a thick and scaleless skin, covered with rough tubercles, the larger of which are arranged in four series along each side of the body. The first dorsal fin is almost entirely concealed by the skin, appearing merely as a lump on the back. The lump-sucker inhabits the coasts of both sides of the North Atlantic.

LUND, a town of Sweden, in the län of Malmöhus, lies at a distance of ten miles by rail northeast from Malmö. It is chiefly remarkable for its university, the second in Sweden, founded by Charles XI. in 1666, with faculties of philosophy, law, medicine, and theology; the number of students ranges from 500 to 600. The library contains about 100,000 volumes and 2,000 MSS., and there are valuable collections in archaeology and natural history. Population, 1900, 16,621.

LÜNEBURG, the chief town of a district in the Prussian province of Hanover, is situated near the foot of a small hill named the Kalkberg, and on the river Ilmenau, fourteen miles above its confluence with the Elbe, and thirty miles to the southeast of Hamburg. Population, 19,045.

LUNÉVILLE, the chief place of an arrondissement in the department of Meurthe and Moselle, France, 240 miles east of Paris by rail on the line to Strasburg, stands in the midst of meadows between the Meurthe and the Vezouze a little above their confluence. It is a handsome town regularly built. Lunéville has always been an important cavalry station, and has a riding school where 200 horsemen can exercise at the same time. The population is 16,041.

LUPERCALIA, one of the most remarkable and interesting Roman festivals. Its origin is attributed to Evander, or to Romulus before he founded the city, and its ceremonial is in many respects unique in Roman ritual. In front of the Porta Romana, on the western side of the Palatine hill, close to the *Ficus Ruminalis* and the *Casa Romuli*, was the cave of Lupercus; in it, according to the legend, the she-wolf had suckled the

twins, and the bronze wolf which is still preserved in the Capitol was placed in it in 296 B.C. But the festival itself, which was held on February 15th under the direction of the *flamen dialis*, contains no reference to the Romulus legend, which is probably later in origin. The celebrants, who were called Luperci, offered in sacrifice goats and a dog; the *flamen dialis* himself was forbidden to touch either kind of animal, and it can hardly be doubted that the Lupercal sacrifice is older than the prohibition. After the sacrifice two of the Luperci were led to the altar, their foreheads were touched with a bloody sword, and the blood wiped off with wool dipped in milk; then the ritual required that the two young men should laugh. The sacrificial feast followed, after which the Luperci cut thongs from the skins of the victims and ran in two bands round the walls of the old Palatine city, striking the people who crowded near. A blow from the thong prevented sterility in women. These thongs were called *Februa*, the festival *Februatio*, and the day *Dies Febructus*; hence arose the name of the month February, the last of the old Roman year. The Lupercalia was therefore a ceremony of purification performed for the walls and for the whole of the old Palatine city, from which it follows that it was dedicated to the peculiar god of that city. In early time the name of the god was kept strictly secret, as it was unsafe that an enemy should know it and be able to invoke him.

LUPINE, *Lupinus*, L., a genus, of over eighty species, of the tribe *Genistæ* of the order *Leguminosæ*. Species with digitate leaves range along the west side of America from British Columbia to Bolivia, while a few occur in the Mediterranean region. A few others with entire leaves are found in South Carolina, the Cape, and Cochin-China. The leaves are remarkable for "sleeping" in three different ways. From being in the form of a horizontal star by day, the leaflets either fall and form a hollow cone with their bases upward, or rise and the cone is inverted, or else the shorter leaflets fall and the longer rise, and so together form a vertical star; the object in every case being to protect the surfaces of the leaflets from radiation. The flowers are of the usual "papilionaceous" or pea-like form, blue, white, purple, or yellow, in long terminal spikes. The stamens are monadelphous and bear dimorphic anthers. The species of which earliest mention is made is probably *L. termis*, Forsk., of Egypt. It is no longer found in Greece, but is extensively cultivated in Egypt. Its seeds are eaten by the poor after being steeped in water to remove their bitterness; the stems furnish fuel and the best charcoal for gunpowder.

LURAY CAVERN, in Page county, Va., is one mile west of the village of Luray, on the Shenandoah Valley Railroad. The valley, here ten miles wide, extends from the Blue Ridge to the Massanutten mountain, and displays remarkably fine scenery. These ridges lie in vast folds and wrinkles; and elevations in the valley are often found to be pierced by erosion. Cave Hill, 300 feet above the water-level, had long been an object of local interest on account of its pits and oval hollows, or sink-holes, through one of which, August 13, 1873, Mr. Andrew J. Campbell and others entered, thus discovering the extensive and beautiful cavern thus named.

Geologically considered, the Luray cavern does not date beyond the Tertiary period, though carved from the Silurian limestone. At some period long subsequent to its original excavation, and after many large stalactites had grown, it was completely filled with glacial mud charged with acid, whereby the dripstone was eroded into singularly grotesque shapes. After the mud had been mostly removed by flowing water, these

eroded forms remained among the new growths. To this contrast may be ascribed some of the most striking scenes in the cave. The many and extraordinary monuments of aqueous energy include massive columns wrenched from their place in the ceiling and prostrate on the floor; the hollow column, forty feet high and thirty feet in diameter, standing erect, but pierced by a tubular passage from top to bottom; the leaning column, nearly as large, undermined and tilting like the campanile of Pisa; the organ, a cluster of stalactites dropped points downward, and standing thus in the room known as the cathedral; besides a vast bed of disintegrated carbonates left by the whirling flood in its retreat through the great space called the Elfin Ramble.

The stalactitic display exceeds that of any other cavern known, and there is hardly a square yard on the walls and ceiling that is not thus ornamented. Streams and true springs are absent, but there are hundreds of basins, varying from one to fifty feet in diameter, and from six to fifteen feet in depth. The water in them is exquisitely pure, except as it is impregnated by the carbonate of lime, which often forms concretions, called, according to their size, pearls, eggs, and snowballs. A large one is known as the cannon ball. On fracture these spherical growths are found to be radiated in structure. The quantity of water in the cavern varies greatly at different seasons. Hence some stalactites have their tips under water long enough to allow tassels of crystals to grow on them, which, in a drier season, are again coated over with stalactitic matter; and thus singular distortions are occasioned. The dimensions of the various chambers included in Luray Cavern cannot easily be stated, on account of the great irregularity of their outlines. But it should be understood that there are several tiers of galleries, and the vertical depth from the highest to the lowest is 260 feet.

The waters of this cavern appear to be entirely destitute of life; and the existing fauna is quite meager, comprising only a few bats, rats, mice, spiders, flies, and small centipedes. When the cave was first entered, the floor was covered with thousands of tracks of raccoons, wolves, and bears—most of them probably made long ago, as impressions made in the tenacious clay that composes most of the cavern floor would remain unchanged for centuries. Layers of excrementitious matter appear, and also many small bones, along with a few large ones, all of existing species. The traces of human occupation as yet discovered are pieces of charcoal, flints, moccasin tracks, and a single skeleton imbedded in stalagmite in one of the chasms, estimated to have lain where found for not more than five hundred years, judging from the present rate of stalagmitic growth.

The temperature is uniformly 54° Fahr., coinciding with that of Mammoth Cave, Kentucky. The air is very pure, and the avenues are not uncomfortably damp.

The portions open to the public are now lighted by electric lamps.

LURGAN, a market-town in the county of Armagh and province of Ulster, Ireland, is situated a few miles south of Lough Meagh, and twenty miles southwest of Belfast by rail. Population (1901), 12,000.

LURISTAN, or **LURISTÂN**, a province of western Persia, stretches northwest and southwest some 260 miles, with a mean breadth of seventy miles and an area of rather less than 20,000 square miles.

LUSATIA (German, *Lausitz*) is a common name applied to two neighboring districts in Germany, Lusatia Superior and Lusatia Inferior, belonging in part to Prussia and in part to Saxony. The country now known as Upper Lusatia was occupied in the seventh century by the Milcieni, a Slavonic tribe. In the tenth

century it was annexed to the German kingdom by the margraves of Meissen, and from this time for several centuries it was called Budissin (Bautzen), from the name of the principal fortress. In the eleventh and twelfth centuries Budissin changed hands several times, being connected at different periods with Meissen, Poland, and Bohemia. The emperor Frederick I. granted it, in 1158, to King Ladislaus of Bohemia, and under him and his immediate successors it was largely colonized by German immigrants. Between 1253 and 1319 it belonged to Brandenburg, to the margrave of which it was given in pledge by King Ottocar II. of Bohemia; and in 1268 it was divided into an eastern and a western part—Budissin proper and Görlitz. In 1319 Budissin proper was restored to Bohemia, which also recovered Görlitz in 1346. In the sixteenth century the Reformation made way rapidly in Upper Lusatia, and the majority of the people became Protestants. The two countries were conquered in 1620, with the sanction of Ferdinand II., by the Saxon elector, John George I., to whom they were ceded in 1635, the emperor as king of Bohemia retaining a certain supremacy for the purpose of guarding the rights and privileges of the Roman Catholic Church. In 1815 the whole of Lower Lusatia and the half of Upper Lusatia were transferred from Saxony to Prussia. Lower Lusatia has 395,800 inhabitants, of whom 50,000 are Wends; the portion of Upper Lusatia belonging to Prussia has 243,500 inhabitants, of whom 32,000 are Wends. There are 300,000 inhabitants, including 50,000 Wends, in Saxon Upper Lusatia.

LUSHAI or **KUKI HILLS**, a wild and imperfectly known tract of country on the northeastern frontier of India, extending along the southern border of the Assam district of Cachár and the eastern border of the Bengal district of Chittagong. On the east the Lushai Hills stretch away into the unexplored mountains of Independent Burmah. This extensive region is occupied by a numerous family of tribes known indifferently as Lushais or Kukis. All these tribes are nomadic in their habits, and subject to successive waves of migration.

LUSTRATION is a term that includes all the methods of purification and expiation among the Greeks and Romans. Among the Greeks there are two ideas clearly distinguishable—that human nature must purify itself from guilt before it is fit to enter into communion with God or even to associate with men, and that guilt must be expiated voluntarily by certain processes which God has revealed in order to avoid the punishment that must otherwise overtake it. It is not possible to make such a distinction among the Latin terms *lustratio*, *piacula*, *piamenta*, *ceremonia*, and even among the Greeks it is not consistently observed. The conception of sin never reached a high moral standard, and the methods of lustration are purely ritualistic. Guilt and impurity arose in various ways; among the Greeks, besides the general idea that man is always in need of purification, the species of guilt most insisted on by religion are incurred by murder, by touching a dead body, by sexual intercourse, and by seeing a prodigy or sign of the divine will. The last three of these spring from the idea that man had been without preparation and in an improper manner brought into communication with God, and was therefore guilty. The first, which involves a really moral idea of guilt, is far more important than the others in Hellenic religion. Among the Romans we hear more of the last species of impurity; in general the idea takes the form that after some great disaster the people become convinced that some guilt has been incurred somewhere and must be expiated. The methods of purification consist in ceremonies per-

formed with water, fire, air, or earth, or with a branch of a sacred tree, especially of the laurel, and also in sacrifice and other ceremonial.

LUTE. The European lute is derived in form and name from the Arabic "el 'ūd," "the wood," the consonant of the article "el" having been retained in the European languages for the initial of the name. The Arab instrument, with convex sound-body, pointing to the resonance board or membrane having been originally placed upon a gourd, was strung with silk and played with a plectrum of shell or quill. It was adopted by the Arabs from Persia, the typical instrument being the two-stringed "tanbur," and ultimately found its way to the West at the time of the crusades. The modern Egyptian "'ūd" is the direct descendant of the Arabic lute, and is strung with seven pairs of catgut strings played by a plectrum.

The lute family is separated from the guitars, also of Eastern origin, by the formation of the sound-body, which is in all lutes pear-shaped, without the sides or ribs necessary to the structure of the flat-backed guitar and cither. Observing this distinction, we include with the lute the little Neapolitan mandolin of two feet long, and the large double-necked Roman chitarrone, which not infrequently attains to a length of six feet. Mandolins are partly strung with wire, and are played with a plectrum, indispensable for metal or short strings. Perhaps the earliest lutes were so played, but the large lutes and theorbos strung with catgut have been invariably touched by the fingers only, the length permitting this more sympathetic means of producing the tone.

The Neapolitan is the best known mandolin; it was indicated by Mozart in the score of *Don Giovanni*, to accompany the famous serenade.

LUTHER. Martin Luther was born at Eisleben, in the county of Mansfeld, in Thuringia, on November 10, 1483. His father, Hans Luther, a slate-cutter by trade, belonged to a family of free peasants. His mother was Margaret Lindeburn. Hans Luther had left Möhra, his native village, and had come to Eisleben to work as a miner. When Martin was six months old he went to Mansfeld and set up a forge, the small profits of which enabled him to send his son to the Latin school of the place. There the boy so distinguished himself that his father determined to make him a lawyer, and sent him for a year to a Franciscan school at Magdeburg, and then to Eisenach near Möhra. There Luther, with other poor scholars, sang for alms in the streets, and his fine tenor voice and gentle manners attracted the attention and gained for him the motherly care of Ursula Cotta, the wife of the burgomaster of Eisenach. From Eisenach he went in his eighteenth year to the high school of Erfurt, where his favorite master was the humanist Trutwetter, who taught him classics and philosophy. He took his bachelor's degree in 1502, and his master's in 1505. At Erfurt the preaching of the town's pastor Weisemann made a deep impression on his mind, as did the preacher's frequent exhortations to study the Scripture. Luther tells us that he sought in vain for a whole Bible, that he could only get portions to read. A dangerous illness, the death of a near friend, together with other circumstances, so wrought on his pious, sensitive nature that in spite of father and family he resolved to give up all his prospects and become a monk. He entered the Augustinian convent at Erfurt in June, 1505. His first years of monastic life were spent in fierce mental struggle. He had found a whole Bible and read it diligently, but it did not bring him peace. The feeling of universal human sinfulness, and of his own, was burnt into him both by his dogmatic studies and by his reading of the Scripture. He lived a

life of the severest mortification, and invented continually new forms of penance, and all the while heart and head alike told him that outward acts could never banish sin.

When Luther regained his mental health, he took courage to be ordained priest in May, 1507, and next year, on the recommendation of Staupitz, the elector of Saxony appointed him professor in the university of Wittenberg, which had been founded in 1502. While in the monastery Luther had assiduously pursued his studies, and his severe mortifications and penances had never interrupted his theological work. He read all the great scholastic theologians, but Augustine was his master in theology. He began by lecturing on Aristotle; and in 1509 he gave Biblical lectures, which from the very first were a power in the university. His class room was thronged; his fellow-professors were students. Staupitz forced him also to preach; and his marvelous eloquence, felt to be from the heart, attracted great crowds of hearers. The year 1511 brought an apparent interruption, but in fact only a new development, of Luther's character and knowledge of the world. He went to Rome, probably in fulfillment of an old vow, and the journey was a marked event in his life. He went up in true pilgrim spirit, a mediæval Christian, and he came back a Protestant. The pious German was horrified with what he saw in Rome, and he afterward made telling use of what he had seen in various tracts, and notably in his address to the German nobles. On his return to the university he was promoted to the degree of doctor of divinity, in October, 1512. The oath he had to take on the occasion "to devote his whole life to study, and faithfully to expound and defend the holy Scripture," was to him the seal of his mission. He began his work with lectures on the Psalms, and then proceeded to comment on the epistles of Paul to the Romans and Galatians, enforcing especially his peculiar views of the relations between law and gospel. His lectures and his sermons were attended by great audiences, and disciples gathered round him. As early as 1516 his special principles were publicly defended at academical disputations. Staupitz made him district-vicar of his order for Meissen and Thuringia. He made short preaching tours, and his influence was felt far beyond Wittenberg. When the plague came to that university town he remained at his post when others fled. Then came 1517, the year of the Reformation. The new pope, Leo X., had sent agents through Germany to sell indulgences, and John Tetzel, a Dominican, had been chosen for Saxony. Luther, who had passed through deep soul-struggles ere he won pardon, knew that God's forgiveness could not be purchased for money, and thundered against Tetzel and his indulgences from Wittenberg pulpit. He wrote anxiously to the princes and bishops to refuse the pardon-seller a passage through their lands. When Tetzel got to Jüterbogk, near Wittenberg, Luther could stand it no longer. He wrote out ninety-five propositions or theses denouncing indulgences, and on the eve of All Saints, October 31st, nailed the paper to the door of the Castle church. In a short time all Germany was ablaze.

These theses, with the sermons explaining them, brought Germany face to face with the reality of blasphemy in the indulgences. Luther's public life had opened; the Reformation had begun.

Pilgrims who had come to Wittenberg to buy indulgences returned with the theses of Luther in their hands, and with the impression of his powerful evangelical teaching in their hearts. The national mind of Germany took up the matter with a moral earnestness which made an impression, not only upon the princes

but even upon bishops and monks. At first it seemed as if all Germany was going to support Luther. The traffic in indulgences had been so shameless that all good people and all patriotic Germans had been scandalized. But Luther had struck a blow at more than indulgences, although he scarcely knew it at the time. In his theses and explanatory sermons he had declared that the inward spiritual facts of man's religious experience were of infinitely more value than their expression in stereotyped forms recognized by the church, and he had made it plain too that in such a solemn thing as forgiveness of sin man could go to God directly without human mediation. Pious Christians since the day of Pentecost had thought and felt the same, and all through the Middle Ages men and women had humbly gone to God for pardon trusting in Christ. But those pious people, hymn-writers, and preachers had not seen that this inward experience of theirs was really opposed to a great part of the ecclesiastical system of their day. The church had set such small store by that inward religious experience that the common speech of the times had changed the plain meanings of the words "spiritual," "sacred," "holy." A man was "spiritual" if he had been ordained to office in the church; money was "spiritual" if it had been given to the church; an estate, with its roads, woodlands, fields, was "spiritual" or "holy" if it belonged to a bishopric or abbey. And the church that had so degraded the meaning of "spiritual" had thrust itself and its external machinery in between God and the worshiper, and had proclaimed that no man could draw near to God save through its appointed ways of approach. Confession was to be made to God through the priest; God spoke pardon only in the priest's absolution. When Luther attacked indulgences in the way he did he struck at this wholesystem.

Compelled to examine the ancient history of the church, he soon discovered the whole tissue of fraud and imposture by which the canon law had from the ninth century downward been foisted upon the Christian world. There is scarcely any essential point in ancient ecclesiastical history bearing upon the question of the invocation of saints, of clerical priesthood, of episcopal and metropolitan pretensions, which his genius did not discern in its true light. He resolved to preach throughout Germany, and in 1518 appeared at a general meeting of his order at Heidelberg. There he held a public disputation on certain theses called by him paradoxes, in which he strove to make apparent the contrast between the external view of religion taught by the schoolmen and the spiritual view of gospel truth based upon justifying faith. On his return to Wittenberg in May, 1518, Luther wrote and published an able and moderate exposition of the theses, and sent it to some of the German bishops. He proclaimed the need for a thorough reformation of the church, which he thought could only be effected, with the aid of God, by an earnest coöperation of the whole of Christendom. This energy awakened opponents. Conrad Wimpina at Frankfurt, Hoogstraten at Cologne, Sylvester Trierias at Rome, and above all John Eck, an old fellow student, at Ingolstadt, attacked his theses, and discovered heresy in them. The result was that Luther was summoned to appear before the pope at Rome, but the elector of Saxony intervened, and got the matter so arranged that Luther was cited to appear before the pope's legate at Augsburg.

The pope was unwilling to quarrel with Germany, where the whole people seemed to be supporting Luther, and the cardinal legate James de Vio of Gaeta, commonly called Cajetan, was told to be conciliatory. Luther went to Augsburg on foot, and presented himself before the legate, but the interview was not a suc-

cessful one. The cardinal began by browbeating the monk, and ended by being somewhat afraid of him. Luther could not respect either the learning or the judgment of Cajetan. He left Augsburg by stealth, afraid of capture, condemned, but appealing "from the pope ill-informed to the pope to-be-better-informed." On his return to Wittenberg he found the elector in great anxiety of mind, in consequence of an imperious letter from the cardinal, and offered to leave Saxony for France. The elector, however, allowed him to remain, and the pope sent another legate to settle the affairs of Germany. This was Carl von Miltitz, a native of Saxony, a man of the world, and no great theologian. He resolved to meet Luther privately, and did so in the house of Spalatin, court preacher to the elector of Saxony. In his interview with Cajetan, Luther had refused to retract two propositions—that the treasury of indulgences is not filled with the merits of Christ, and that he who receives the sacrament must have faith in the grace offered to him. Miltitz made no such demands. He apparently gave up Tetzel and the indulgences, agreed with much of Luther's theology, but insisted that he had not been respectful to the pope, and that such conduct weakened the authority which rightly belonged to the church. He wished Luther to write to the pope and apologize. Luther consented. It was further arranged that both parties were to cease from writing or preaching on the controverted matters, and that the pope was to commission a body of learned theologians to investigate. Luther accordingly wrote to the pope, telling him that he "freely confessed that the authority of the church was superior to everything, and that nothing in heaven or on earth can be preferred before it save only Jesus Christ, who is Lord over all." This was in March, 1519. Meanwhile Luther had appealed from the pope to a general council to be held in Germany. In the end of 1518, a papal bull concerning indulgences had appeared, confirming the old doctrine, without any reference to the late dispute.

The years 1519, 1520, 1521 were a time of fierce but triumphant struggle with the hitherto irresistible Church of Rome, soon openly supported by the empire. The first of these years passed in public conferences and disputations. Luther had promised Miltitz to refrain from controversy, on the understanding that his adversaries did not attack him, and he kept his word. But his old antagonist, John Eck, published thirteen theses attacking Luther, and challenged Andrew Bodeinstein of Carlstadt, a friend and colleague of Luther, to a public disputation. Luther instantly replied to Eck's theses, and the disputation between Carlstadt and Eck was immediately followed by one between Eck and Luther. In this famous Leipzig disputation the controversy took a new shape. It was no longer a theological dispute; it became a conflict between two opposing sets of principles affecting the whole round of church life. Luther and Eck began about indulgences and penance, but the debate soon turned on the authority of the Roman Church and of the pope. Eck maintained the superiority of the Roman Church and of the pope as successor of St. Peter and vicar-general of Christ. His argument was "no pope no church." Luther denied the superiority of the Roman Church, and supported his denial by the testimony of eleven centuries, by the decrees of Nicæa, by the Holy Scriptures. He maintained that the Greek Church was part of the church of Christ, else Athanasius, Basil, and the Gregories were outside Christianity. The pope has more need of the church, he said, than the church has of the pope. Eck retorted that these had been the arguments of Wickliffe and of Huss, and that they had been condemned at the council of Con-

stance. Luther refused to admit that the condemnation was right; Eck refused to debate with an opponent who would not abide by the decision of oecumenical councils; and so the disputation ended.

During 1520 the first great political crisis occurred, on the occasion of the death of Maximilian, and ended fatally, in consequence of the want of patriotic and political wisdom among the German princes. Charles, the son of Maximilian, was elected emperor, and that election meant the continuation of a mediæval policy in Germany.

Meanwhile Luther was at Wittenberg continuing his course of preaching, lecturing, and writing. The number of matriculated students had increased from 232 in 1517 to 458 in 1519, and to 579 in 1520; but large numbers besides these came to hear Luther. The study of Greek and Hebrew was diligently carried on, and the university was in a most flourishing state. Some of the finest productions of Luther's pen belong to this period—his *Sermons* on the sacraments, on excommunication, on the priesthood, on good works, his *Address to the Christian Nobility of the German Nation on the Reformation of Christendom*, and *The Babylonian Captivity of the Church*. The address to the German nobles, published on June 26, 1520, created a great deal of excitement not only in Germany but beyond it. It was this appeal which first made Zwingli feel sympathy with Luther, who showed in this little book that the Romish doctrine of two estates, one secular and the other spiritual, was simply a wall raised round the church to prevent reform. His address raised the cry of Germany for the Germans, civil government uncontrolled by ecclesiastics, a married clergy, while he called for a national system of education as the foundation of a better order of things. The most important work of the time, however, was the *Babylonian Captivity of the Church of God* (October, 1520), in which he boldly attacked the papacy in its principles. The printing press sent thousands of these books through Germany, and the people awaited the bull, armed beforehand against its arguments. The bull was published at Rome on July 15, 1520. It accused Luther of holding the opinions of Huss, and condemned him. Eck brought it to Leipsic, and published it there in October. It was posted up in various German towns, and usually the citizens and the students tore it down. At last it reached Luther. He answered it in a pamphlet, in which he called it the execrable bull of Antichrist, and at last he proclaimed at Wittenberg that he would publicly burn it. On December 10, 1520, at the head of a procession of professors and students, Luther passed out of the university gates to the market-place, where a bonfire had been laid. One of the professors lighted the fuel, and Luther threw the bull on the flames; a companion flung after it a copy of the canon law. Germany was henceforth to be ruled by the law of the land, and not by the law of Rome. The news flashed over all Germany, kindling stern joy. Rome had shot its last bolt; if Luther was to be crushed, only the emperor could do it. On December 17th Luther drew up before a notary and five witnesses a solemn protest, in which he appealed from the pope to a general council. This protest, especially when we take it along with other future acts of Luther, meant a great deal more than many historians have discerned. It was the declaration that the Christian community is wider than the Roman Church, and was an appeal from later mediæval to earlier mediæval ideas of catholicity.

The pope had appealed to the emperor to crush heresy in Germany, and Charles V., with his Spanish training and his dreams of a restored mediæval empire, where he might reign as vicar of God, had promised his aid. He

had declared, however, that he must pay some regard to the views of Frederick of Saxony, from whom he had received the imperial crown, and had in the end resolved to summon Luther before the diet to be held at Worms. The diet was opened by Charles in January, 1521, and the papal nuncio, Hieronymus Alexander (afterward archbishop of Brindisi and cardinal), urged first privately and then publicly in the diet that Luther should be condemned unheard, as one already tried and convicted by the papal bull. He threatened the Germans with excommunication, it is said, in case of their refusal to accede to his requests. But the princes had their own quarrel with Rome, and urged besides that it would be unfair to condemn a man unheard and untried. A committee appointed by the diet presented a list of 100 grievances of the German nation against Rome. This startled the emperor, who, instead of ordering Luther's books to be burned, issued only a provisional order that they should be delivered to the magistrate. He then sent to summon Luther before him, and granted him a safe conduct to and from the diet. In April Luther set out for Worms. Before leaving Wittenberg he had devised with his friend Lucas Cranach, the artist, what he called "a good book for the laity," a series of wood-cuts depicting contrasts between Christ and the pope, with explanations in pithy German. Luther went to Worms, believing that he was going to his death. Everywhere on the road he saw the imperial edict against his books posted up, yet his journey was in some sort a triumphal progress; the people came out in crowds to meet him, and at Erfurt the herald gave way to the universal request, and, against his instructions, permitted Luther to preach. On the 16th Luther entered the imperial city amid an immense concourse of people. Next day he was brought before the diet.

When he appeared before the diet he was asked by John Eck, an official of the archbishop of Treves (to be distinguished from Eck the theologian), whether the books piled on a table were his, and whether he would retract what was written in them. Luther acknowledged his writings, and requested that as the matter written concerned the highest of all subjects, the word of God and the welfare of souls, he might have time for consideration before he answered the second question. His request was granted, and he retired. Luther's resolution had been taken before he appeared at the diet; he only desired to convince friends as well as foes that he did not act with precipitation at so decisive a moment. The next day he employed in prayer and meditation, making a solemn vow upon a volume of Scripture to remain faithful to the gospel, should he have to seal his confession with his blood. When he was again brought before the diet, he answered at great length, dividing his writings into three kinds:—(1) those in which he had written about faith and morals in such fashion that even his opponents admitted that what he had said was worth reading; he could not retract these; (2) those in which he had condemned the papacy and popish doings, which had ruined Christendom body and soul; to retract these would be mean and wicked, and he would not; (3) those in which he had attacked private persons with perhaps more vehemence than was right; he would not retract, but would readily listen to any one who pointed out errors. He spoke in German with earnestness and force, but the emperor and his followers scarcely understood him, and he was asked to repeat his answer in Latin. He did so, and the papal party were irritated; the official declared that they were not there to make distinctions or to discuss things which had been long ago settled by councils; let the accused say whether he recanted or not. Luther answered, "Well, then, if your imperial majesty and your graces

require a plain answer, I will give you one of that kind without horns and teeth. It is this. I must be convinced either by the witness of Scripture or by clear arguments, for I do not trust either pope or councils by themselves, since it is manifest that they have often erred and contradicted themselves—for I am bound by the Holy Scriptures which I have quoted, and my conscience is held by the word of God. I cannot and will not retract anything, for to act against conscience is unsafe and unholy. So help me God. Amen." Eck asked him whether he actually meant to say that general councils had erred. He answered that he declared, and that openly, that councils had erred several times, that the council of Constance had erred. Eck replied that he surely did not mean to say that general councils had erred. Luther persisted that he could prove that they had erred in many places. The emperor made a sign to end the matter, and Luther said, "I can do naught else. Here stand I, God help me, Amen." He went back to his lodgings in deep depression of spirit, but was comforted on learning that the elector had told Spalatin, "Doctor Martin has spoken well in Latin and in German before the emperor and all the princes and estates of the empire; only he is too keen for me." Luther's answer created very various feelings among those who heard him. The Italians and Spaniards wished the safe conduct revoked, and Luther burnt at once. Most of the Germans resolved to protect him at all hazards. The emperor deliberated for a day, and then declared that he meant to permit Luther to return safely from the council, but that his opinions were to be condemned, and all who clung to them punished for the future. At last the edict of the diet was pronounced, in which Luther was condemned in the severest terms, and placed under the ban of the empire. This meant that when his safe conduct expired he was an outlaw, and that all people were forbidden to give him food or fire or shelter. His books were to be burnt, his goods confiscated, and his adherents punished. Whoever disobeyed the edict incurred the ban of the empire.

Frederick the elector of Saxony thought that Luther's life was no longer safe, as in twenty-one days his safe conduct would expire. Luther was hurried away from Worms, and as he traveled back to Wittenberg he was stopped near Eisenach by a band of armed knights, and carried to the fortified castle of the Wartburg above Eisenach by Frederick's orders. The elector's fears, as matters turned out, were exaggerated. Germany was in no mood to give Luther up, and there were threatenings of risings when he disappeared, only appeased when it was whispered about that he was in friendly keeping. Luther remained at the Wartburg, dressed as a knight, ordered to let his beard grow, and bearing the name Junker George, for ten months, and made use of his enforced leisure to begin what was perhaps his greatest literary work, his translation of the Scriptures from the original texts. The New Testament was almost entirely his own work. He used for the text Erasmus' fourth edition, and took incredible pains with his work. Some of his MS. still survives, and shows that he corrected and recorrected with great pains. Some passages were altered at least fifteen times. The translation of the New Testament was first published on September 21, 1522, and a second edition appeared in December. By choosing the Franconian dialect in use in the imperial chancery, Luther made himself intelligible to those whose vernacular dialect was High German or Low German, and his Bible is still the standard of the German tongue, and has preserved unity of language, literature, and thought to the German nation during its political disintegration. The translation of the Old Testament, begun in the same

year, was a much more tedious task, and Luther was assisted in it by what Matthesius calls a private Sanhedrim. Bugenhagen, Justus Jonas, Melancthon, Aurogallus, Roser, and several Jewish rabbis made the "Sanhedrim." Up to this time there had been no change in the church services. The true doctrine of the gospel had been preached in Germany, and Romish rites and ceremonies had been exhibited as abuses, but not a single word or portion of these ceremonies had been changed, and Luther felt that the time had come to bring the preaching and the usages into harmony with each other. In the midst of these labors news came to him that Germany was threatened with a new sale of indulgences. The cardinal archbishop of Mainz, Albert of Brandenburg, unable to pay the 26,000 ducats due to Rome for his pallium, had resolved to raise the money by indulgences. Luther wrote a fierce tractate *Against the New Idol at Halle*. The archbishop getting word of this, sent to Frederick asking him to restrain Luther from attacking a brother-elect, and Frederick wished Luther to desist. He was indignant, but at the request of Melancthon he agreed to lay the treatise aside until he had written to the archbishop. "Put down the idol within a fortnight, or I shall attack you publicly," he wrote; and the archbishop in reply thanked Luther for his Christian brotherly reproof, and promised, "with the help of God, to live henceforth as a pious bishop and Christian prince."

Luther's absence from his congregation, his students, and his friends and books at Wittenberg weighed heavily upon him, and he began to hear disquieting rumors. Carlstadt and other friends at Wittenberg were urging on the Reformation at too rapid a rate. Their idea was that everything in worship not expressly enjoined in the Bible should at once be abolished. The churches were to be stripped of crucifixes, images of saints, and the ritual of the mass; the festivals of the Christian year were to be neglected, the monastic life to be put down by force; and some even wished it ordained that all clergymen should be married. To Luther all this seemed dangerous, and sure to provoke a reaction; the changes insisted upon were to him matters of indifference, which might be left to the individual to do or leave undone as he pleased. Auricular confession, the reception of the Lord's supper under both forms, pictures in churches, the observance of festivals and fasts, and the monastic life were *adiaphora*. He wrote earnestly warning his friends against rashness and violence, and he was anxious and distressed. Still he held out patiently till events occurred which called for his presence. Certain men claiming to be prophets, Nicolaus Storch, a weaver, and his disciple Thomas Münzer, belonging to the village of Zwickau, near the Erzgebirge on the borders of Bohemia, preached wildly a thorough-going reformation in the church and the banishment of priests and Bibles. All believers were priests, they said, and all the faithful had the Holy Spirit within them, and did not need any such external rule as Holy Scripture. They were banished from Zwickau, and came to Wittenberg, where Carlstadt joined them. Fired by their preaching, the people tore down the images in the churches and indulged in various kinds of rioting. Luther felt he could remain no longer in hiding. He left the Wartburg, suddenly appearing in Wittenberg on March 3, 1522, and plunged at once into the midst of struggles very different from those which he had hitherto so victoriously overcome. He found things in a worse state than he had feared; even Melancthon had been carried away. Luther preached almost daily for eight consecutive days against Carlstadt and the fanatics from Zwickau, and in the end he prevailed and the danger was averted.

When Charles V. had laid Luther under the ban of the empire, he had undoubtedly been greatly influenced by political considerations. Francis I. of France and Charles of Spain were rivals, and the whole of the European policy of the time turns on this rivalry. The opponents schemed to attract to themselves and to divert from their neighbor the two outside powers of England and the papacy, and in 1521 it was the policy of Charles to win alliance with the pope. The Germans saw that they were being sacrificed in this game of statecraft, and there was no great willingness even among Roman Catholics to put the edict of Worms in force. Luther at the Wartburg and at Wittenberg was protected by the national feeling of Germany from attack. The diet of the empire met in 1522 at Nuremberg, and the new imperial council, which ruled in the emperor's absence, and fairly represented the popular feeling in Germany, was in no mood to yield to the papacy. Leo X. had died, and his successor Adrian VI., an orthodox Dominican and an advocate for reformation in the cloisters and in the lives of the clergy, proposed to begin reformation by crushing the German heresy. He instructed his nuncio to the diet to demand the execution of the edict of Worms. The imperial council refused until the grievances of Germany were heard and redressed. The nuncio found that the pulpits of the free imperial city were filled with preachers, mostly monks, who were making the city resound with gospel preaching. He asked the diet at least to arrest the preachers; the diet pleaded incompetence. He proposed to seize them himself in the pope's name; the magistrates threatened to release them by force, and the nuncio had to desist. The diet then presented a hundred gravamina or subjects of complaint which the German nation had against the papacy, including in the list indulgences, dispensations bought for money, absentee bishops and other ecclesiastics, the use of bans and interdicts, pilgrimages, excessive demands for money, and the decisions of matrimonial cases in ecclesiastical courts. The complaint was an expansion of Luther's address to the German nobles. The nuncio could do nothing, and was forced to accept by way of compromise a decision from the diet that only "the true, pure, sincere, and holy gospel" was to be preached in Germany. Nuremberg reversed the edict of Worms. Next year the diet met again at Nuremberg, and the new pope, Clement VII., sent the celebrated cardinal-legate Lorenzo Campeggio to demand the execution of the edict of Worms. The diet asked in return what had become of the hundred grievances of the German nation, to which Rome had never deigned to return an answer. Campeggio declared that at Rome the document had been considered merely as a private pamphlet; on which the diet, in great indignation, insisted on the necessity of an œcumenical council, and proceeded to annul the edict of Worms—declaring, however, in their communication to the pope, that it should be conformed to as much as possible, which with respect to many cities and princes meant not at all.

Finally it was resolved that a diet to be held at Spire was to decide upon the religious differences. But between Nuremberg and Spire an event occurred, the revolt of Sickingen and the knights, which was destined to work harm to the Reformation. The diet of Spire met, and many of the members being inclined to connect Sickingen and Luther, there was a strong feeling against the Reformation, but the feeling was not strong enough to induce the diet to comply with the demands of the legate Campeggio and revoke the decisions of Nuremberg, and it refused to execute the edict of Worms. Campeggio, however, was able to separate Germany into two parties, and this separation became

apparent at the convention of Ratisbon, where Bavaria, Austria, and other South German states resolved to come to separate terms with the papacy. The curia promised to stop a number of ecclesiastical extortions and indulgences, to make better appointments to benefices, and to hand over some of the ecclesiastical estates to the Austrian and Bavarian princes; while the states promised to set aside the gravamina, and to permit no toleration of the new doctrines. On the other hand, many states which had kept aloof from the Reformation now joined it, and declared against the seven sacraments, the abuses of the mass, the worship of saints, and the supremacy of the pope. The emperor's brother and successor Ferdinand was a bitter foe to the Reformation, and urged persecution. Four Augustinian monks at Antwerp were the first martyrs; they were burnt on July 1, 1523. Ferdinand began the bloody work of persecution in the hereditary states of Austria immediately after the convention of Ratisbon. At Passau in Bavaria, and at Buda in Hungary, the faggots were lighted. The dukes of Bavaria followed the same impulse.

Luther's literary activity during these years was unparalleled. In 1522 he published, it is said, 130 treatises, and 83 in the following year, among them the famous *Contra Henricum regem Angliæ*. His principal work, however, during these years was the publication of certain short tracts upon worship and its reform, followed by various directories for public worship, which afterward served as a model for the numerous Lutheran Church ordinances. In 1522, while Luther was still in the Wartburg, Carlstadt had published for the church at Wittenberg an ordinance for directing the government and worship of the church. It was very brief, but very revolutionary. This was withdrawn after Luther's return; but the Reformer felt that the time had come for a definite reform of public worship and for publishing his views upon the subject. Accordingly, after a series of tracts in 1522 upon religious and monastic vows, the abolition of private masses, the Lord's Supper under both forms, saint worship, the so-called spiritual estate, and the married life, he published in 1523 *The Order of the Worship of God*. He was, as usual, conservative, and made as few changes as possible in the form of service, caring only to give full place to prayer and the reading and preaching of the word. The order of worship was followed by the *Formula Misse*, published in Latin, but at once translated into German by Paul Speratus, in which the ancient form was as much preserved as is consistent with evangelical doctrine. Luther was of opinion that the more difficult introits should be removed from the order of the Eucharist, and simpler hymns put in their place, and he also was strongly in favor of the singing of hymns in the common worship. This led to the publication in 1524 of a small collection of church hymns, which was Luther's first *German Church Hymn-book*, and which was the beginning of the German Protestant hymnology. In the same year Luther translated the order of baptism, and published it under the title of *Das Tauf-Büchlein*. He also drew up a directory for public worship for Leisnig. The hymn-book was followed by a prayer-book, and by the publication of a short summary of the heads of Christian truth fitted for the instruction of the "rude common man." Luther's catechism for children completed this series of works, intended to aid worship, public and private.

In the third period the epic of Luther's life was changed into tragedy; the revolt of the knights under Sickingen, the Anabaptist tumults, and the peasants' war in the Black Forest alienated the sympathies of many from the Reformation, and resulted in a divided

Germany. From Sickingen's rising Luther sedulously kept himself aloof, but the insurgent had more than once proclaimed himself on Luther's side, and that was enough to make many of the princes resolve to have nothing to do with reform. The convention of Ratisbon was the result of Sickingen's abortive revolt. The Anabaptists have to do with Luther's history mainly in so far as his contact with them modified and gave final shape to his doctrine of baptism.

More important was the connection between the Lutheran movement and the peasant revolt. The first coalitions of the peasants against the intolerable rapacity and cruelty of the feudal aristocracy had begun before the close of the fifteenth century. But all the oppressed inclined toward Luther, and the oppressors, most of whom were sovereigns, bishops, and abbots, toward the pope. The struggle in the peasants' war was really between the reforming and the papist party, and it could easily be foreseen that Luther would be dragged into it. As early as January, 1525, the revolutionary movement had extended from the Black Forest into Thuringia and Saxony, and the peasants were eagerly looking to Luther for help. The more moderate party published their programme in twelve articles, with a very remarkable preface, in which they stated that they did not wish for war, and asked nothing that was not in accordance with the gospel.

Luther evidently felt himself appealed to. The crisis was difficult, and, in spite of what has been said in his defense, he failed, as he failed afterward in the conference with the Swiss deputies at Marburg. Had Luther thrown the weight of his influence into the peasants' scale, and brought the middle classes, who would certainly have followed him, to the side of the peasants, a peaceful solution would in all probability have been arrived at, and the horrors of massacre averted. But Luther, bold enough against the pope or the emperor, never had courage to withstand that authority to which he was constantly accustomed, the German prince. He began by speaking for the peasants in his address to the lords, and had courage enough to tell them some plain truths. He was courageous enough also in asking the peasants to refrain from violence, and in telling them that they would put themselves in the wrong by rebellion. But what Luther did not see was that the time for good advice had gone by, and that he had to take his stand on one side or the other. The bloody struggle came; the stream of rebellion and destruction rolled on to Thuringia and Saxony, and Luther apparently lost his head, and actually encouraged the nobles in their sanguinary suppression of the revolt, in his pamphlet entitled *Against the Murdering, Robbing Rats of Peasants*, where he bounds on the authorities to "stab, kill, and strangle." The princes leagued together, and the peasants were routed everywhere. One army, with neither military arms nor leaders, was utterly routed at Frankenhausen, another at Würtemberg. Fifty thousand were slain or butchered by wholesale executions. Among this number many of the quietest and most moderate people were made victims in the general slaughter, because they were known or suspected to be friends of the Reformation and of Luther, which indeed all the citizens and peasants of Germany were at that time. None felt more deeply, when it was too late, this misery, and what it involved in its effect on the cause of the gospel in Germany, than Luther; and he never recovered the shock.

The prospect was dark enough for the Reformer. Ferdinand of Austria and the duke of Bavaria were imprisoning and slaying Christians on account of the gospel. The emperor, fresh from his victory at Pavia, and the pope were combining to crush the Reformation,

and it was rumored that the kings of France and England were to lend their aid. The convention of Ratisbon had resulted in a Roman Catholic league in which Duke George of Saxony, Albert elector-archbishop of Mainz, and the duke of Brunswick were the leaders. Luther also found that the war had demoralized the Protestant congregations, and that they were becoming ignorant and savage. And in May, 1525, the elector Frederick died.

It was under such auspices that Luther decided to take a wife, as he had long advised his friends among the priests and monks to do. He married Catherine Von Bora, a lady twenty-four years of age, of a noble Saxon family, who had left her convent together with eight other sisters. Luther married her on June 11, 1525, in the presence of Lucas Cranach and another friend as witnesses. Catherine Von Bora had no dowry, and Luther lived on his appointment as professor; he would never take any money for his books. His marriage was a happy one, and was blessed with six children. He was a tender husband, and the most loving of fathers. In the close of the year 1525, Luther was engaged in controversy with Erasmus on the freedom of the will.

Meanwhile the emperor had been again successful in his political schemes. His German army under the Constable Bourbon and General Frundsberg had seized upon Italy and had sacked Rome, and again he had brought the pope and Francis to terms. It only remained to subdue the Reformation, and the mediæval empire might be restored. He first sent a dispatch saying that the edict of Worms was to be held as in force. When the diet met at Spires in 1529, the imperial commissioners forbade the celebration of worship according to the reformed usage in churches, and afterward in the houses of the elector and of the landgrave. The Act of Toleration of 1526 was to be abrogated. The diet appeared to be hopelessly divided, a majority with the emperor and a minority with the elector and the landgrave, and the majority passed an edict which amounted to this, that where the edict of Worms could not be executed without fear of revolution no further reforms were to be allowed. The minority prepared a protest. "The diet has overstepped its authority," they said; "our acquired right is that the decree of 1526, unanimously adopted, remains in force until a council can be convened. Up to this time the decree has maintained the peace, and we protest against its abrogation." Ferdinand, who represented his brother, assured the princes that nothing remained for them but to submit; he threatened the free cities with the loss of their privileges and with an interdict, and he left the diet while the evangelical members were deliberating. In spite of these threats the protest was signed by John of Saxony, George of Brandenburg, Ernest of Lüneburg, Philip of Hesse, and Wolfgang of Anhalt among the princes, and by the representatives of the free cities of Strasburg, Nuremberg, Ulm, Costnitz (Constance), Lindau, Memmingen, Kempten, Nördlingen, Heilbronn, Reutlingen, Isny, St. Gall, Weissenburg, and Windsheim. This celebrated protest of April 15, 1529, led to the name Protestant.

If this great act be considered impartially, it is impossible not to see that neither Luther nor Melancthon was the real leader of the time. Luther had no real comprehension of what had to be done in Germany to preserve the gospel from destruction. He had shown little sympathy with the first attempt made in Hesse at the self-government of the church; still less did he see the importance of the protest at Spires, and of the unity it gave to the evangelical cause. It was evident that nothing but the inroad of the Turks had saved Protest-

ant princes after the diet, and that Charles was so far master of Germany as to make it impossible for Germany to become a Protestant nation. Luther lived under the shadow of the Middle Ages, and had been trained in scholastic law as well as in scholastic theology. To the mediæval jurist the emperor was the impersonation of all social order and moral law; he was the vicar of God. In the later Middle Ages the jurists had exaggerated this sacredness of the emperor, and had done so quite naturally in order to protect civil law from canon law, and to uphold the state against the church. Luther could throw off scholastic theology, but he could not throw off that scholastic jurisprudence that all his mediæval heroes, Occam, Wycliffe, and Huss, had found so useful in their attacks on the papacy, and that Luther himself had found so serviceable when he appealed from the church defined by the pope to the church defined by the empire. He could not bear to think of an alliance against the Holy Roman empire.

Philip of Hesse induced the Swiss and the German theologians to meet at Marburg. Luther was gloomy and suspicious, "as he had never been seen before," a friend said. The frank declarations of the Swiss Reformers soon cleared away all shadows of difference and dissent on all points but one, and fourteen articles defining the chief heads of Christian doctrine were adopted by both parties. Then came the discussion on the fifteenth, the doctrine of the Eucharist. Luther took a piece of chalk and wrote upon the table *Hoc est corpus meum*, and when worsted in argument, as he usually was, appealed to the sentence. The discussion, which lasted four days, however, resulted in the parties recognizing exactly where the point of difference lay, and in reducing it to its smallest dimensions. Both declared that they agreed in recognizing the Eucharist to be a sacrament of the true body and blood of Christ, and that a spiritual partaking of this body was a means of grace. They differed whether the true body and blood of Christ were *corporeally* in the sacrament. It was hoped that time would bring about alliance if not agreement, but Luther was obstinate. "Submit yourselves, believe as we do, or you cannot be acknowledged as Christians." He refused Zwingli's hand. "You have another spirit from us," he said, meaning that there was no objective basis of faith between them, owing to what he thought to be Zwingli's rationalism. The result was a sad one, but Zwingli was to some extent a gainer; his view became naturalized in Germany, where Swabia adopted it, as did many of the imperial cities, and Philip of Hesse indicated that he preferred it.

The Marburg conference was a sad prelude to the decisive diet to be held at Augsburg in 1530. The new diet was anxiously awaited. Charles had made known his intention to be present, and that he intended to enforce obedience to the edict of Worms. He entered Augsburg with great magnificence, and was in fact at the zenith of his power. Meanwhile Luther, Melancthon with him, was at Coburg, near enough at hand for consultation and yet beyond the emperor's reach. Melancthon was preparing a confession with a defense, the so-called *Apology*, in case the emperor should require a statement of their doctrines. Luther was writing commentaries on the Psalms and the prophets, and was also preparing a popular edition of *Esop's Fables*. Luther all the while had been quiet, waiting in patience; but this was too much for him, and he wrote to encourage the elector to resist. At length the Protestants were asked to present their confession. The emperor ordered it to be read in Latin. "No," said the elector, "we are Germans and on German ground. I hope, therefore, your majesty will allow us to speak German." At this critical moment Luther's indigna-

tion found vent. "I understand," he wrote to Melancthon, "that you have begun a marvelous work, to make Luther and the pope agree together, but the pope will say that he will not, and Luther begs to be excused. Should you, however, after all, succeed in your affair, I will follow your example, and make an agreement between Christ and Belial. Take care that you give not up the justification by faith; that is the heel of the seed of the woman to crush the serpent's head. Take care not to acknowledge the jurisdiction of the bishops; they will soon take all. In short, your negotiations have no chance of success unless the pope will renounce papacy." The Romanists fortunately demanded too much. Not even Melancthon could yield the acknowledgment of private masses, of auricular confession, and of the meritorious character of good works; and the negotiations ceased. While they were in progress the emperor tried to intimidate the princes by calling the imperial troops into the free city of Augsburg and closing the gates. The landgrave escaped, and this frightened the Catholics. Unfortunately the Protestants had confessed their want of union by presenting three confessions of faith: the Lutherans had presented the Augsburg confession; Strasburg, Constance, Memmingen, and Lindau, which sympathized to some extent with Zwingli, presented the *Confessio Tetrapolitana*; and Zwingli had sent a confession which was not, however, laid before the diet. The diet broke up with the final decision that the Protestants should have till next spring to consider whether they would voluntarily return to the church, and that, if they proved obstinate, then measures would be taken for their extermination.

To the student of Luther's life the diet of Augsburg is noteworthy chiefly because it was the occasion of the composition of the Augsburg confession, or *Augustana*, which afterward became the symbol or confession of faith for the Lutheran Church. It was prepared by Melancthon, founded on the fifteen articles of the Marburg conference, on the seventeen articles of Schwabach, and on the articles of Torgau. These various sets of articles had been written by Luther, and therefore the Augsburg confession was strictly Luther's own.

The edict of the diet was published on November 19th, and the Protestant princes, after having overcome the resistance of Luther, met for conference at Smalkald on Christmas, 1530, and formed an armed league for mutual defense. It had been declared that the edict would be put into execution in the spring of 1531, but when the time came the emperor had other work on hand: France had become troublesome, and the Turks were again moving. He found also that he could not count on the support of the Roman Catholic princes in the suppression of the Protestants. In presence of danger the Zwinglians and Lutherans showed a united front, and the Smalkald league grew to be a formidable power. The emperor resolved to come to terms with his Protestant subjects, and the result was the religious peace or rather truce of Nuremberg, which left things as they were until a general council should settle matters. The years following this peace of Nuremberg were comparatively prosperous to the Reformation. The Smalkald league was the only organized power in Germany, and very effectually prevented the oppression of Protestants by Roman Catholics. Year by year their numbers increased, and Luther saw the evangelical cause prospering. First Würtemberg was won back for young Duke Christopher, who had become a Protestant, and found on his entry to his dukedom that his people were already secret Protestants. In northern and central Germany whole districts embraced the evangelical doctrines. Electoral Brandenburg and ducal Saxony had

received Protestant rulers, who found their people more than willing to accept the creed of their new sovereigns. At last the only large states that were able to maintain a firm front against the Lutheran doctrines were Austria, Bavaria, the Palatinate, and the great ecclesiastical provinces on the Rhine, and even in these regions visitations of the churches had shown that the people were forsaking the old faith. It appeared that a more serious defection than any might at any moment be made. The elector-archbishop of Cologne showed signs of abandoning the Roman Catholic faith and secularizing his vast episcopal territories, and this threatened defection made Charles bestir himself. If the elector became a Protestant the Lutherans would be in a majority in the electoral college, and a Protestant emperor might be elected.

During all these years Luther was quietly at work at Wittenberg, lecturing, preaching, and writing. At first he felt anxious lest civil war should break out, and he had scruples about many of the doings, and even about the very existence, of that league which was really giving the land peace. Under Philip of Hesse the Reformation was assuming a national and political shape which alarmed Luther, who was more than ever content to keep out of public life and keep himself to his books. He began publishing his lectures on various portions of Scripture, on the Epistle to the Galatians and on the Psalms of Degrees. He wrote one or two controversial tracts, mainly to show how the Reformers could not accept the conditions offered by the Roman Catholics at Augsburg. In 1534, to his great joy, the first complete translation of the whole Bible was published, and next year appeared a new edition of the Wittenberg hymn-book, containing several new hymns. Philip of Hesse, notwithstanding the failure of the conference at Marburg, still thought that something might be done to remove the theological differences between Switzerland and Saxony or at least between Swabia, Strasburg and Wittenberg. The divines of Switzerland and of South Germany had by their publications made this somewhat easier. The confession of Basel, drafted by (Ecolampadius (1531), revised by Myconius, and published by the magistracy of Basel, had declared that in the Lord's Supper Christ is the food of the soul to everlasting life, and Bucer, and the other South-German divines were anxious for a union. Philip of Hesse, Bucer, and Melancthon met in conference at Cassel to arrange preliminaries, not without suspicion on Luther's part, for he could not trust Melancthon at a conference, and, as he remarked to Justus Jonas, he hated trimmers above all men on the earth's surface. The result, however, was better than he had hoped for. Bucer drew up a short confession which was to be submitted to the Wittenberg theologians, and was favorably received by them, and the South German theologians were invited to a further conference at Wittenberg. The meeting very fairly represented all the German states, and the result was the document known as the *Wittenberg Concordia*. This document, mainly drawn up by Bucer and Melancthon, contains a statement of the doctrine of the sacrament of the supper expressed according to the Lutheran formula, with the declaration that unworthy or faithless partakers really do not participate in the sacrament. Melancthon and Bucer had used too much diplomatic skill in drawing up the formula, for the essential differences between the Wittenberg and the Strasburg school were not really faced and explained; they were covered over with ambiguous language. Nor could the document be accepted by the Swiss; but for a time it seemed as if a satisfactory basis of peace had been established. The general satisfaction was increased by the publication of the

First Helvetic Confession, which, while stating the doctrine of the sacrament of the supper in a manner essentially Zwinglian, laid special emphasis on the real spiritual presence of Christ in the elements. Luther in a letter to Meyer, burgomaster of Basel, and also in his answer to the Reformed cantons, acknowledged the earnest Christianity of the confession, and promised to do his best to promote union with the Swiss. It is sad to think that only three years later his old animosity to Zwingli and his countrymen broke out again in his book against the Turks, and that he renewed the sacramental controversy with even more than the old fury in his *Short Confession of the Holy Sacrament*, published in 1544. This first Helvetic confession was drawn up, however, for another purpose than to appease the Wittenberg theologians. Charles V. was urging the pope to call a general council to end the disputes within the Christian church, and it seemed so probable that a council would meet that the Protestants were everywhere preparing themselves by doctrinal statements for taking their share in its work. The German princes and their theologians were also greatly exercised about this council, and the thought of it and how Protestants should bear themselves in its presence was filling Luther's mind. He wrote several short papers on the subject in the years 1534-39.

The pope, Paul III., yielding to the pressure of the emperor and of such liberal Roman Catholics as Vergerius, his legate in Germany, called a council to meet in May, 1537, at Mantua, and invited the Lutherans to be present. The Lutheran princes and theologians felt compelled to face the question whether they could or could not accept the invitation, and Luther, at the request of the elector of Saxony, prepared a creed to be used as a basis of negotiations. This was submitted to the princes and theologians assembled at Smalkald, and was in substance adopted by them. It is called the Smalkald Articles, and is important because in its statement of the doctrine of the sacrament of the supper it repudiates the Wittenberg Concord. The princes decided that they would have nothing to do with a council which did not meet on German soil. The emperor, alarmed at the progress of Protestantism, and at the united front shown by German Protestants, and troubled by the refusal of the pope to consent to a council to be held out of Italy, strove to bring Protestants and Roman Catholics together by means of religious conferences. The first of these, held at Hagenau, came to nothing. Next year (1541) the conference was renewed at Worms, when the Roman Catholic party promised reforms on condition that the Protestants first submitted to the pope. This condition could not be accepted. Representatives met the same year at Ratisbon, and here the conference was wrecked on the doctrine of transubstantiation, but the diet renewed the terms of the edict of Nuremberg of 1532—the Ratisbon Interim. It was felt by all parties that this provisional state of matters must come to an end some time, and that the Protestants must either be allowed to have their own way or win it by fighting. The emperor was not ready for war, and at the diet at Spire, in 1544, it was agreed that the Protestants were to maintain their rights until a general council met. Whatever hopes they might have from such a council were soon dissipated. The council of Trent was opened that year, and its earliest acts were to refuse to pass the conciliatory measures proposed by some of the liberal Roman Catholics. The emperor still temporized and promised reforms, if not by a council then by a national assembly, and many of the Protestants, Luther among them, still hoped that matters might settle themselves without civil war. This

hope inspired what was called the *Wittenberg Reformation*, a document setting forth how near the evangelical church might approach the Roman Catholic and still retain the truths it had upheld. The year 1546 began, however, with unmistakable indications that Charles was now ready to strike a decisive blow.

Luther had been suffering much during the last few years, and he felt his end to be near. In the month of January, 1546, he undertook a journey to Eisleben in very inclement weather, in order to restore peace in the family of the counts of Mansfeld; he caught a violent cold, but preached four times, and took all the time an active part in the work of conciliation. On February 17th, he felt that his release was at hand; and at Eisleben, where he was born, he died, on the following day.

LUTHERANS are that body of Christians who adopted the principles of Martin Luther in his opposition to the Roman Church, to the Swiss theologians, and to the sectaries of Reformation times. They called themselves "Evangelical," in distinction from the "Reformed," or followers of Calvin, and formed one of the two great divisions of the Reformation Church. The early Lutheran theology reflected the character of its founder. It lacked systematic completeness, more especially in its failure to construct a comprehensive doctrine of the work of the Holy Spirit, and it swayed from side to side in violent controversies, until at length, out of the conflicts, emerged the Form of Concord, which, it was hoped, would succeed in pacifying the church. The dogmatic symbols of the Lutheran Church are usually said to include nine separate creeds, three of which are taken from the early Christian Church, while six are the production of the sixteenth century. They are the Apostles' Creed, the Nicæo-Constantinopolitan Creed in its Western form (*i.e.*, with the *filioque*), the so-called Athanasian Creed, the Augsburg Confession or Confessio Augustana, the Apology for the Augsburg Confession, the Smalkald Articles, Luther's two Catechisms, and the Form of Concord. These nine confessions together make up the *Liber Concordiæ* of the Lutheran Church, but only the three pre-Reformation creeds and the Augsburg Confession are recognized by all Lutherans. Luther's catechisms, especially the shorter of the two, have been almost universally accepted, but the Form of Concord was expressly rejected by many Lutheran churches. The Augsburg Confession and Luther's Shorter Catechism may be said to contain the distinctive principles of Lutheranism which all Lutherans unite to maintain, but, as the principal controversies of the Lutheran Church all arose after the publication of the Augsburg Confession, and were fought out between men who united in accepting that symbol, it does not contain all that is distinctively Lutheran. The Augsburg Confession itself, perhaps, owed its universal recognition to the fact that it existed in two forms which vary slightly in the way in which they state the doctrine of the sacrament of the supper, the *variata*, and the *invariata*; and this also bears witness to the lack of dogmatic coherence which is a characteristic of Lutheranism. Melancthon's *Hypotyposes* or *Theological Commonplaces* (first published in 1521) may also rank along with these creeds as an authoritative exposition of Lutheran theology, and the changes it underwent in its successive editions show the incompleteness of the system.

LUTON, a market-town and municipal borough of Bedfordshire, England, is situated in a fine valley near the source of the Lea, thirty-one miles northwest of London. The population, which in 1871 was 17,317, was 23,959 in 1889.

LUTZK, a district town of Russia, in the government of Volhynia, on the Styir, 162 miles west-north-west of Sztomir, and five miles from the Kivertzy station of the railway between Kieff and Brest-Litovskoy. Population (1890), 12,000.

LUXEMBOURG, FRANÇOIS HENRI DE MONTMORENCY-BOUTTEVILLE, DUC DE, marshal of France, the comrade and successor of the great Condé, was born at Paris on January 8, 1628. His father, the Comte de Montmorency-Boutteville, had been executed six months before his birth for killing the Marquis de Beuvron in a duel, but his aunt, the Princesse de Condé, recognizing in him the last male heir of her great family De Montmorency, took charge of him, and educated him with her son, the Duc d'Enghien. The young Montmorency attached himself enthusiastically to his cousin and shared his successes and reverses throughout the troubles of Fronde. He returned to France in 1659 and was pardoned, and Condé, who was then much attached to the Duchesse de Châtillon, Montmorency's sister, contrived the marriage of his adherent and cousin to the greatest heiress in France, the Princesse de Tingry, after which he was created Duc de Luxembourg and peer of France. At the opening of the war of the Devolution, 1667-68, Condé, and consequently Luxembourg, had no command, but in the second campaign he served as one of Condé's lieutenants in the conquest of Franche Comté. During the four years of peace which followed the peace of Aix-la-Chapelle, Luxembourg diligently cultivated the favor of Louvois, and in 1672 received orders to commence hostilities with the Dutch. He defeated the prince of Orange, whom he was to beat again and again, at Woerden, and ravaged Holland, and in 1673 made his famous retreat from Utrecht with only 20,000 men in face of 70,000, an exploit which placed him in the first rank of generals. In 1674 he was made captain of the gardes du corps, and in 1675 was made marshal of France. In 1676 he was placed at the head of the army of the Rhine, but failed to keep the duke of Lorraine out of Philipsburg; in 1677 he stormed Valenciennes; and in 1678 he defeated the prince of Orange, who attacked him at St. Denis after the signature of the peace of Nimeguen. On July 1, 1690, he defeated the prince of Waldeck at Fleurus with the loss of 14,000 men and forty-nine pieces of cannon. In the following year he commanded the army which covered the king, who was besieging Mons, and defeated William III. of England at Leuze on September 18, 1691. Again in the next campaign he covered the king's siege of Namur, and utterly defeated William at Steenkerk on June 5, 1692; and on July 29, 1693, he won his greatest victory over his old adversary at Neerwinden, in which he took seventy-six pieces of cannon and eighty flags. In the campaign of 1694, Luxembourg did but little in Flanders, except his well-known march from Vignamont to Tournay in face of the enemy. On his return to Versailles for the winter he fell ill, and died on January 4, 1695.

LUXEMBURG, a grand-duchy of Europe, governed under a special constitution by the king of the Netherlands, is bounded on the north and east by Rhenish Prussia, south by Lorraine and the French department Meurthe-et-Moselle, and west by Belgian Luxembourg. It measures thirty-two miles from Hartelingen to Rosport, both on the Sure, and fifty miles from Rumelange in the south to Weiler in the north. The surface contains 639,000 acres (998 square miles), of which 293,554 acres are arable, 61,033 meadowland, 143,812 woodland, 54,135 coppice, and 540 vineyards. The soil of Luxembourg is generally good; the southern districts are on the whole the most fertile as well as the most popu-

ious. Building materials of all sorts are obtained throughout the duchy, and in the south there is iron ore of fair quality, the mining area at present occupying from 8,000 to 10,000 acres. Since 1842 Luxemburg has been included in the Zollverein, and its principal dealings are, consequently, with Germany. A German patois mixed with French words is spoken throughout the country; but French, which is universally employed by the commercial community, is also the common speech of all classes on the French and Belgian frontiers. Though perfect liberty of worship prevails, Roman Catholicism is almost the sole form of religion in the duchy, the only dissenters worthy of note being the Protestant Prussian employés and about three hundred Jewish families. The government is in the hands of the grand-duke, who sanctions and promulgates the laws. Between 1850 and 1879 the king of the Netherlands was represented in his grand-ducal functions by his brother Prince Henry; but since the prince's death he has resumed the personal direction of affairs. The grand-duchy is a neutral and independent state, and its crown hereditary in the Nassau family (Treaty of London, March 11, 1867). The administration of the town of Luxemburg depends immediately on the government. Education is in a flourishing state; there are 642 primary schools attended by 31,000 pupils; Luxemburg has a normal school and an atheneum; Diekirch and Echternach have each a gymnasium. The bishopric of Luxemburg, containing thirteen deaconates, subdivided into 253 parishes, holds its authority directly from the Holy See. From 12,000,000 to 15,000,000 francs is the annual amount of the state budget, and the public debt is 12,000,000 francs.

By the treaty of London about 1,218 square miles of the duchy with 149,571 inhabitants were transferred to Belgium, the German confederation and King William being compensated with parts of Limburg. On the dissolution of the confederation the duchy became free from its connection with Germany, but the fortress remained in the hands of Prussia. A diplomatic contest for possession of the duchy took place between France and Prussia; and the matter became the object of a special conference of the plenipotentiaries of the great powers, Holland, Belgium, and Italy, in 1867. The result was that the neutrality of Luxemburg was guaranteed and the military importance of the town destroyed. The actual demolition of the fortifications evacuated by the Prussians in September, 1867, did not take place till 1872.

LUXEMBURG, the capital of the grand-duchy, lies thirty-four miles north of Metz and twenty-five southwest of Treves, in a position as remarkable for natural beauty as for military strength. Till their demolition in terms of the treaty of 1867 the fortifications, on which the engineers of three centuries had expended their skill, were the great feature of the place; in point of strength they ranked, according to Carnot, second only to those of Gibraltar, and like them they were to a great extent hewn out of the solid rock. The site is now occupied partly by a fine public park, partly by new districts of handsome houses. The population of the city and suburbs (1901), 20,928; of the duchy, 236,543.

LUXEMBURG, a province of the kingdom of Belgium, lying at the southeastern extremity of the country, and bounded north and west by the provinces of Liège and Namur, south by France, and east by Prussia and by the grand-duchy of Luxemburg, from which it was separated in 1839. It is the largest and most thinly populated of the Belgian provinces—seventy-five miles in length, thirty in breadth; the pop. (1901) is 219,200. The ground is high, averaging 1,200 feet

above sea-level, and rising in parts over 2,000. The soil is dry and slaty, with occasional sand and limestone. The whole district is comprised within the region of Ardennes. The agricultural produce is poor; the various breeds of horses, cattle, sheep, etc., are remarkably small, though they all possess individual qualities of endurance or their flesh of flavor; the hams are renowned.

LUXOR, more properly El-Aksur, "The Castles," a village on the Nile, 450 miles above Cairo, occupies part of the site of the ancient Thebes, and has its name from the ruins described under EGYPT. The district is the seat of an extensive manufacture of forged antiques, often very skillfully made.

LUZON, or LUGON. See PHILIPPINE ISLANDS.

LYCANTHROPY is a term used comprehensively to indicate a belief, firmly rooted among all savages, and lingering in the form of traditional superstition among peoples comparatively civilized, that men are in certain circumstances transformed temporarily or permanently into wolves and other inferior animals. In the European history of this singular belief, wolf transformations appear as by far the most prominent and most frequently recurring instances of alleged metamorphosis, and consequently in most European languages the terms expressive of the general doctrine have a special reference to the wolf. Examples of this are found in the Greek *Lycanthropos* (wolf-man), Russian *volkodlak*, English *were-wolf*, German *währwolf*, French *loup-garou*. And yet general terms are sufficiently numerous to furnish some evidence that the class of animals into which metamorphosis was possible was not viewed as a restricted one. It is simply because the old English general terms have been long diverted from their original signification that the word "lycanthropy" has recently been adopted in our language in the enlarged sense of a species of insanity developing in a man a delusion that he is a wolf, and leading to acts of murder and cannibalism. Such were the cases of the Gandillon family (1568) and others in various parts of France. Other more modern instances could be cited.

LYCAON, son of Pelagus or of Aizeus, was the mythical first king of Arcadia, who founded the first city Lycosoura and the worship of Zeus on Mount Lycæus. He, or his fifty impious sons, entertained Zeus and set before him a dish of human flesh; the god pushed away the dish in disgust and overturned the table at a place called Trapezus. In punishment either lightning slew the king and his sons, or they were turned into wolves. Pausanias says that Lycaon sacrificed a child to Zeus, and was during the sacrifice turned into a wolf. Henceforth the story ran—a man was turned into a wolf at each annual sacrifice to Zeus Lycæus, recovering his human form after ten years if he had not during that time eaten human flesh.

LYCAONIA, in ancient geography, was the name given to a province in the interior of Asia Minor, north of Mount Taurus. It was bounded on the east by Cappadocia, on the north by Galatia, on the west by Phrygia and Pisidia, while to the south it extended to the chain of Mount Taurus, from which it was, however, in part separated by Isauria, though some writers included that district in Lycaonia. Its boundaries appear indeed to have varied at different times, as was the case with all the nations of Asia Minor. The name is not found in Herodotus, but Lycaonia is mentioned by Xenophon as traversed by Cyrus the younger on his march through Asia. That author, however, describes Iconium, one of the principal cities of Lycaonia, as included in Phrygia. But in Strabo's time the limits of the province were more clearly recognized, though Isauria was by some authors considered as a

part of Lycaonia, by others as a distinct province. Ptolemy, on the other hand, includes Lycaonia as a part of Cappadocia, with which it may have been associated by the Romans for administrative purposes; but the two countries are clearly distinguished both by Strabo and Xenophon.

LYCIA, in ancient geography, was the name given to a district in the southwest of Asia Minor, occupying the portion of the coast between Caria and Pamphylia, and extending inland as far as the ridge of Mount Taurus. The region thus designated is one strongly marked by nature, as constituting a kind of peninsula or promontory projecting toward the south from the great mountain masses of the interior. It was also inhabited from a very early period by a distinct people, known to the Greeks as Lycians, but whose native name, according to Herodotus, was Termile, or (as it is written by Hecateus) Tremile, and this is confirmed by native inscriptions, in which the name is written Tramilæ. Herodotus tells us also that they were not the original inhabitants of the country, which was previously occupied by the Milyans, and this is rendered probable by the fact that a people of that name was still found in the rugged mountainous district in the northeast, who appear to have always continued distinct from the Lycians.

LYCOPHRON was a Greek poet who flourished at Alexandria in the time of Ptolemy Philadelphus, (285-47 B.C.) He was born at Chalcis in Eubœa, and was the son of Lycus. He wrote a number of tragedies, forty-six or sixty-four, and Suidas gives the titles of twenty of them. Only a few lines are preserved of these works which gained him a place in the Pleiad of Alexandrian tragedians.

LYCOPODIUM. This and *Selaginella* are the two chief genera of the order *Lycopodiaceæ* or club mosses. They are flowerless herbs, and mostly creeping; but during the period of the development of coal plants members of this order attained to the dimensions of lofty trees. A remarkable bed of Scotch coal called the "better bed" was found on microscopical examination to be almost entirely composed of the spores and sporanges of some "lycopod." There are one hundred species, which occur in all climates, five being British. The leaves of lycopodium are for the most part small, and thickly cover the stem and branches. The "fertile" leaves are arranged in cones, and bear sporanges in their axils, containing spores of one kind only (of two kinds in *Selaginella*). The prothallium developed from the spore is a subterranean mass of tissue of considerable size, and bears the male and female structures (*antheridia* and *archegonia*). *L. Selago*, *L.*, and *L. catharticum*, Hook., of South America, have been said to be, at least when fresh, cathartic; but, with the exception of the spores ("lycopodium powder"), lycopodium as a drug has fallen into disuse. The powder is used for rolling pills in, as a dusting powder for infants' sores, etc. It is highly inflammable, and is used in pyrotechny and for artificial lightning on the stage. If the hand be covered with the powder it cannot be wetted on being plunged into water. Another use of lycopodium is for dyeing.

LYCURGUS, a famous Spartan lawgiver. As even the ancients themselves differed so widely in their accounts of Lycurgus, that Plutarch could begin his life by saying that he could assert absolutely nothing about him which was not controverted, it is not surprising that modern historical criticism has been disposed to relegate him wholly into the region of pure myth. One tradition would put him as far back as the age of Troy; another would connect him with Homer; while Herodotus implies that he lived in the tenth century B.C. It is now usual, on the strength of a passage in Thucydides, which represents Sparta as having enjoyed a well-

established political constitution for as much as 400 years before the Peloponnesian war, to assign him to the ninth century B.C., and to accept him as a real historical person. But as to the character and result of his legislative work there still remain very conflicting opinions, due to the circumstance that such data as we possess are susceptible of exceedingly diverse inferences and interpretations. Plutarch's life, which is the fullest and most detailed account we have of him, is not merely the compilation at second hand of a late age (second century), but also abounds in statements which anyone with any knowledge of the early growth of political societies feels to be inherently improbable. Grote prefers, on the whole, to be guided by what may be fairly inferred, from the allusions to his legislation in Aristotle, as being one of our earliest sources of information, and certainly the most philosophical estimate of his work. With Thirlwall he takes him to have been a real person, and assumes that he was the instrument of establishing good order among the Spartans, hitherto, according to Herodotus, the most lawless of mankind, and of thus laying the foundations of Spartan strength and greatness.

LYCURGUS, one of the ten great Attic orators, was born about 396-93 B.C. He is said to have been a pupil both of Plato and of Isocrates. His early career is unknown, but after the real character of the great struggle with Philip of Macedon was becoming manifest he was recognized along with Demosthenes and Hyperides as one of the chiefs of the national party. He left the care of external relations to his colleagues, and devoted himself to the internal organization and the financial administration of the state. He managed the finances of Athens for twelve successive years, being chosen minister of finance, probably in 341 B.C., for a term of four years, and in the two succeeding terms, when the actual office was forbidden him by law, directing it through a nominal official chosen from his party.

LYDGATE, JOHN, a monk of Bury St. Edmunds, was the most famous English poet of the fifteenth century. The exact dates of his birth and death are not ascertained, but he began his occupation as a versemaker before Chaucer's death, and probably ended it several years before the Wars of the Roses broke out.

LYDIA. It is difficult to fix the boundaries of Lydia very exactly, partly because they varied at different times, partly because we are still but imperfectly acquainted with the geography of western Asia Minor. The name is first found, under the form of Luddi, in the inscriptions of the Assyrian king Assur-bani-pal, who received tribute from Gyges about 660 B.C. In Homer we read only of Mæonians, and the place of the Lydian capital Sardes is taken by Hyde (*Il.*, xx. 385), unless this was the name of the district in which Sardes stood. The earliest Greek writer who mentions the name is Mimnermus of Colophon, in the 37th Olympiad. According to Herodotus, the Mæones (called Mæones by other writers) were named Lydians after Lydus, the son of Attyis, in the mythical epoch which preceded the rise of the Heraclid dynasty. In historical times, however, the Mæones were a tribe inhabiting the district of the Upper Hermus, where a town called Mæonia (now *Mennen*) existed. The Lydians must originally have been an allied tribe which bordered upon them to the northwest, and occupied the plain of Sardes or Magnesia at the foot of Tmolus and Sipylus. Next to Sardes, Magnesia ad Sipylum was the chief city of the country, having taken the place of the ancient Sipylus, now probably represented by an almost inaccessible acropolis discovered by Mr. Humann not far from Magnesia on the northern cliff of Mount Sipylus.

LYELL, SIR CHARLES, one of the greatest of geological thinkers, was the eldest son of Charles Lyell, of Kinrordy, Forfarshire, and was born November 14, 1797, on the family estate in Scotland. His father was a man of literary and scientific tastes, known both as a botanist and as the translator of the *Vita Nuova* and the *Convito* of Dante. From his boyhood Lyell had a strong inclination for natural history, especially entomology. He was educated at Midhurst and at Exeter College, Oxford, where the lectures of Dr. Buckland first opened out to him that field of geological study which became the passion of his life. After taking his degree in 1821, he entered Lincoln's Inn, and in 1825 was called to the bar, and went on the western circuit for two years. During the whole of this time, though not neglecting his profession, he was slowly gravitating toward the life of a student of science. In 1819 he had been elected a member of the Linnean and Geological Societies, communicating his first paper, *On the Marls of Forfarshire*, to the latter society in 1822, and acting as one of the honorary secretaries in 1823. In that year he went to France, with introductions to Cuvier, Humboldt, and other men of science, and in 1824 made a geological tour in Scotland in company with Dr. Buckland. In 1826 he was elected a fellow of the Royal Society, from which in later years he received both the Copley and Royal medals; and in 1827 he finally abandoned the legal profession and devoted himself to geology.

Long prior to this, however, he had already begun the sketch of his principal work, *The Principles of Geology*, in pursuance of which he made geological tours over large portions of the Continent, and in later years to Madeira and to the United States and Canada. The journey undertaken with Murchison in 1828 was especially fruitful in results. The first volume of the *Principles of Geology* appeared in 1830, and the second in January, 1832. Received at first with considerable opposition, at least so far as its leading theory was concerned, the work had ultimately a great success, and it had already reached a second edition in 1833, when the third volume, dealing with the successive formations of the earth's crust, was added.

In August, 1838, Lyell published the *Elements of Geology*, which, from being originally an expansion of the fourth book of the *Principles*, became a standard work of reference in stratigraphical and paleontological geology. His third great work, *The Antiquity of Man*, appeared in 1863, and ran through three editions in one year. In this he laid before the world a general survey of the arguments for man's early appearance on the earth, derived from the discoveries of worked flint implements in Post-Pliocene strata in the Somme valley and elsewhere; and in it also he first gave in his adhesion to Darwin's theory of the origin of species.

While thus occupied with his writings, Lyell lost no opportunity of carrying out original investigations, and whenever absent from his literary work in London was always to be heard of in the field either in England or on the Continent. In 1831 he held for a short time the post of professor of geology at King's College, London, and delivered while there a highly appreciated course of lectures, which became the foundation of the *Elements of Geology*. In 1834 he made an excursion to Denmark and Sweden, the result of which was his celebrated paper to the Royal Society, *On the Proofs of the Gradual Rising of Land in Certain Parts of Sweden*, and another to the Geological Society, *On the Cretaceous and Tertiary Strata of Seeland and Mœn*. In 1837 he was again in Norway and Denmark, and in 1841 he spent a year in traveling through the United States, Canada, and Nova Scotia. This last journey, together

with a second one to America in 1845, when he visited Boston, Philadelphia, New Orleans, and the alluvial plain of the Mississippi, gave rise, not only to numerous original papers, but also to the publication of two works not exclusively geological, *Travels in North America* (1845) and *A Second Visit to the United States* (1849). In the second work especially he did much to promote good feeling between England and America, by showing a just appreciation of American society and institutions. It was in the course of these journeys that he estimated the rate of recession of the falls of Niagara, and of the annual average accumulation of alluvial matter in the delta of the Mississippi, and studied those vegetable accumulations in the "Great Dismal Swamp" of Virginia, which he afterward used in illustrating the formation of beds of coal. He also studied with great care the coal-formations in Nova Scotia, and discovered in company with Dr. Dawson of Montreal the earliest known land shell, *Pupa vetusta*, in the hollow stem of a *Sigillaria*. But it was chiefly in bringing a thorough knowledge of European geology to bear upon the more widely extended and massive formations of the North American continent that Lyell rendered immense service to geologists on both sides of the Atlantic.

Besides these transatlantic journeys Lyell undertook geological excursions at different times to all parts of the British Isles, to Belgium, Switzerland, Germany, Spain, Madeira, and Teneriffe, in which latter islands, which he visited in company with G. Hartung, he accumulated much valuable evidence on the age and deposition of lava-beds and the formation of volcanic cones. He also revisited Sicily in 1858, when he made such observations upon the structure of Etna as entirely refuted the theory of "craters of elevation" upheld by Von Buch and Élie de Beaumont. Lyell received the honor of knighthood in 1848, and was created a baronet in 1864, in which year he was president of the British Association, meeting at Bath. His services to the science of geology were now universally recognized both at home and abroad, and he was a member of almost every Continental and American society. He was elected corresponding member of the French Institute and of the Royal Academy of Sciences at Berlin, and was created a knight of the Prussian Order of Merit.

During the latter years of his life his sight, always weak, failed him altogether, and he became very feeble. He died on February 22, 1875, in his seventy-eighth year, and was buried in Westminster Abbey.

LYLY, or LILLY, or LYLIE, JOHN, the famous author of *Euphues*, was born in Kent in 1553 or 1554. At the age of sixteen, according to Wood, he became a student at Magdalen College, Oxford, where in due time he proceeded to his bachelor's and master's degrees (1573 and 1575), and whence we find him in 1574 applying to Lord Burghley "for the queen's letters to Magdalen College to admit him fellow." The fellowship, however, was not granted, and Lyly shortly after left the university. If we are to believe Wood, he never took kindly to the proper studies of the university. After he left Oxford, where he had already the reputation of a "noted wit," Lyly seems to have attached himself to Lord Burghley. In 1578 he began his literary career by the composition of *Euphues, or the Anatomy of Wit*, which was licensed to Gabriel Cawood on December 2, 1578, and published in the spring of 1579. *Euphues and his England* appeared in 1580, and, like the first part of the book, won immediate popularity. For a time Lyly was the most successful and fashionable of English writers. He was hailed as the author of "a new English," and, as Edmund Blount, the editor of his plays, tells us in 1632,

"that beautie in court which could not parley Euphuism was as little regarded as she which nowe there speaks not French." After the publication of *Euphuus*, however, Lyly seems to have entirely deserted the novel form himself, which passed into the hands of his imitators, and to have thrown himself almost exclusively into play-writing, probably with a view to the mastership of revels whenever a vacancy should occur. Eight plays by him were probably acted before the queen by the children of the Chapel Royal and the children of St. Paul's between the years 1584 and 1589, one or two of them being repeated before a popular audience at the Blackfriars Theater. What may have been Lyly's subsequent fortunes at court we do not know. Edmund Blount says vaguely that Elizabeth "graced and rewarded" him, but of this there is no evidence. After 1590 his works steadily declined in influence and reputation; other stars were in possession of the horizon; and so far as we know he died poor and neglected in the early part of James I.'s reign. He was buried in London at St. Bartholomew the Less on November 20, 1606.

LYMINGTON, a municipal and parliamentary borough and seaport town of Hampshire, England, is situated on the Lym at its entrance to the Solent opposite the Isle of Wight, ninety-four miles southwest of London and fifteen south of Southampton. Population, 6,000.

LYNCHBURG, a city in Campbell county, Va., is finely situated on the rising ground to the south of the James river, 144 miles by rail, west-by-south of Richmond. Having excellent facilities of communication by the Richmond and Allegheny, the Norfolk and Western, and the Virginia Midland Railways, together with the James River canal, and possessing abundant water-power and immediate access to coal and iron, Lynchburg has become the seat of no small commercial and industrial activity. The tobacco trade, which formerly rendered it the wealthiest city of its size in the United States, except New Bedford, Mass., is still the staple; there are eighty factories in the town. Most of the operatives are negroes—men, women, and children all being employed. The local iron-works and flour-mills are of some importance, and large machine-shops are maintained at Lynchburg. Two reservoirs, constructed in 1828 and 1878, supply the town with water. The population was 3,067 in 1850, 6,853 in 1860, 6,825 (3,353 colored) in 1870, 15,959 in 1880, and is now (1900), 18,891.

LYNCH LAW, a term used in the United States to characterize the action of private individuals, organized bodies of men, or disorderly mobs, who, without legal authority, proceed to punish by hanging or otherwise real or suspected criminals, without a trial according to the ordinary forms of law. The origin of the term is doubtful. American lexicographers generally refer it to the practice of a supposed Virginia farmer of the seventeenth century, named Lynch, who, when he caught a wrongdoer, was wont to tie him to a tree and flog him, without waiting to summon the officers of the law. He is also said to have acted, by request of his neighbors, though without any legal authority, as a judge in the summary trial of persons accused of crime. Others trace the origin of the name to the act of James Fitzstephen Lynch, mayor and warden of Galway, Ireland, in 1493, who is said to have "hanged his own son out of the window for defrauding and killing strangers, without martial or common law, to show a good example to posterity." Others trace it still further to the old Anglo-Saxon verb *lynch*, meaning to beat with a club, to chastise, etc., which they assert has survived in this cognate meaning in America, as have many other words and expressions long obsolete in Great Britain. While lynch

law does not generally prevail in the older States of the Union, and is almost universally deprecated, it is sometimes resorted to even in these States, in times of great popular excitement, or when the legal penalty seems disproportioned to the enormity of the offense. Lynch law prevailed to a large extent in the early history of California, Oregon, Nevada, Kansas, Colorado, and other western States and Territories, and during the border troubles attending the outbreak of the civil war. Bodies of citizens, organized secretly or openly under the well-known names of "vigilance committees," "vigilantes," "regulators," "law-and-order-men," etc., punished with summary severity, and generally with wise discretion, horse thieves, highway robbers, burglars and swindlers, as well as murderers. Certain rude forms of trial were generally observed, but acquittals were rare, and the punishment was usually death by hanging. The practice, however barbarous under the conditions of well-settled government and society, has its justification in necessity in the newly settled districts, frontier towns, and mining camps, where a rapid and extraordinary influx of population has preceded the establishment of civil government, or where the assembling of a large number of bold and hardened desperadoes has enabled them to defy the legally constituted authorities, and to commit crime at will, until suppressed by the voluntary and concerted action of the order-loving portion of the community.

LYNDHURST, JOHN SINGLETON COPLEY, BARON, four times lord chancellor of England, was born at Boston, Mass., in 1772. His father, son of an Englishman, but also a native of Boston, was a painter of considerable note, who settled in London just before the commencement of the war of American independence. The son studied at Cambridge, where he was second wrangler and fellow of Trinity. Called to the bar in 1804, he gained a considerable practice; but it was not till 1817 that he began to come to the front. In that year he was one of the counsel for Dr. Watson, tried for his share in the Spa Fields riot. On this occasion Copley so distinguished himself as to attract the attention of Castlereagh and other Tory leaders, under whose patronage he entered parliament, and was advanced to the highest legal positions, becoming solicitor-general in 1819, attorney-general in 1824, and lord-chancellor in 1827, with the title of Lord Lyndhurst. Before being thus taken up by the Tories, Copley was a man of the most advanced views, a Republican and Jacobin; and his accession to the Tories naturally excited a good deal of comment, which he bore with the greatest good humor. He gave a brilliant and eloquent but by no means rancorous support to all the reactionary measures of his chief. The same year that he became solicitor-general he married a fashionable wife, and began to take a conspicuous place in society, in which his noble figure, his ready wit, and his never-failing *bonhomie* made him a distinguished favorite.

As solicitor-general he took a prominent part in the trial of Queen Caroline. To the great Liberal measures which marked the end of the reign of George IV. and the beginning of that of William IV., he gave a vigorous opposition. During the Melbourne administration from 1835 to 1841 he figured conspicuously as an obstructionist from his seat in the House of Lords. His former adversary, Lord Brougham, now ineffably disgusted at his treatment by the Whig leaders, soon became his most powerful ally in opposition; and the two dominated the House of Lords. Throughout all the Tory governments from 1827 Lyndhurst held the chancellorship; and in the Peel administration (1841-46) he resumed that office for the fourth and last time. As in regard to Catholic emancipation, so in the agitation

against the corn laws, he opposed reform till his chief gave the signal for concession, and then he cheerfully obeyed. After 1846 and the disintegration of the Tory party consequent on Peel's adoption of free trade, Lord Lyndhurst was not so assiduous in his attendance in parliament. Yet he continued to an extreme old age to take a lively interest in public affairs, and occasionally to astonish the country by the power and brilliancy of his speeches. That which he made in 1853, in denunciation of the aggressive policy of the Russian Emperor Nicholas, made a sensation in Europe; throughout the Russian war he was a strong advocate of the energetic prosecution of hostilities. In 1859 he denounced with his old energy the restless ambition of Napoleon III. He strenuously supported the admission of Jews into parliament; his second wife was a Jewess. Under the influence of Mrs. Norton he appeared also as the advocate of women's rights in questions of divorce. His last speech, marked by his wonted brilliancy and vigor, was delivered in the House of Lords at the age of eighty-nine. He died in 1863, in his ninety-second year.

LYNDSAY, SIR DAVID, for about two centuries and a half perhaps the most popular poet of Scotland, was born about 1490, probably either at the family estate of The Mount, in the parish of Monimail, near Cupar in Fife, or at Garleton near Haddington in East Lothian, where the ruins of an old mansion house of the Lyndsays still remain. Little is known of his boyhood, but he is understood to have entered the university of St. Andrews about 1505, and he became one of the *incorporati* of St. Salvator's College in 1508 or 1509. After leaving college there is reason to think that he went abroad for a year or two, visiting, it is supposed, both France and Italy; but of this there is no certain information. In 1511 he must have been attached in some way to the court of James IV. On the birth of James V. in 1512 he was appointed to be the personal attendant of the young prince, in which situation he remained till James had attained his twelfth year in 1524. Lyndsay's close connection with the court led to his being present at the remarkable scene just before Flodden, in the church of Linlithgow, when the so-called apparition came in "calling loudly for the king," and, after warning him against proceeding on his ill-judged expedition against England, vanishing away "as it had been a blink of the sun or ane whiss of the whirlwind." It is to the credit of the king, however, and characteristic of the generous disposition of the earlier Stuarts, that he never forgot or forsook the friend of his infant and boyish years. For when he fell under the power of the Douglas in 1524, and when Lyndsay had to take his dismissal from court, James took care that his salary should continue to be paid him; and no sooner did he escape from their domination than Lyndsay was at once recalled, and the appointment of Lyon-king conferred upon him. This was in 1529, and it is a remarkable proof of the reputation which Lyndsay had by this time acquired for prudence and sterling practical ability that he was at various times sent abroad in connection with embassies from Scotland. Mr. Laing, on the authority of an entry in the Privy Seal Register, states that his death must have taken place early in 1555.

LYNN, a city in Essex county, Mass., situated near the north end of Massachusetts Bay, on a harbor formed by the peninsula of Nahant, ten miles northeast of Boston, with which it is connected by different lines of railway. The bulk of Lynn is built on the low grounds near the sea; but in the northeast the elevation is greater, and behind the city proper there is a range of porphyritic hills dotted with villas. Most of the houses are of wood, those of the main thorough-

fare—Market Street—of brick. The city hall, a substantial erection of brick and brown stone, is considered one of the finest buildings of its class in New England. It contains the free public library, founded in 1862. It was at Lynn that the first smelting-works in this part of the country were established, in 1643; but the place has long been famous rather for the making of boots and shoes, a department, indeed, in which it has hardly a rival in the world. This trade was introduced in 1750 by a Welshman, John Adam Dagyr; in 1767 the output was 80,000 pairs, in 1810, 1,000,000 pairs; in 1880, 16,276,380—the greater proportion being cheap shoes for women and children. The total value of the output for 1900 was \$25,000,000. About nine thousand hands are employed, though labor-saving machinery is freely introduced. Another industry of great local importance is the tanning and dressing of sheep and goat skins, and the making of morocco leather. The population was 6,138 in 1830, 14,257 in 1850, 28,233 in 1870, 38,284 in 1880, and 68,513 in 1900.

LYNN REGIS, KING'S LYNN, or LYNN, a parliamentary and municipal borough and seaport of Norfolk, England, is situated on the Great Ouse, about two miles from the Wash, and on several railway lines, 100 miles north of London and forty-eight west-northwest of Norwich. The population of the borough in 1871 was 16,562, and in 1901 was about 21,000.

LYNX, a name now appropriated to several animals forming a small section of the cats or genus *Felis*. It is not quite certain to which of these, if to any of them, the Greek name *Lynx* was especially applied, though it was more probably the caracal than any of the northern species. The so-called lynxes of Bacchus were generally represented as resembling panthers rather than any of the species now known by the name. Various fabulous properties were attributed to the animal, whatever it was, by the ancients, that of extraordinary powers of vision, including ability to see through opaque substances, being one; whence the epithet "lynx-eyed," which has survived to the present day, although having no foundation in fact.

The caracal or Persian lynx, *Felis caracal*, an animal about the size of a fox, is of slender build, with a moderately long tail, reaching down to the heels. It is of a uniform vinous or bright fulvous brown color above, and is paler, sometimes almost white, beneath. It is quite or almost entirely unspotted. The tail has a black tip, and the ears are black externally, long and upright, pointed, and surmounted by a pencil of fine black hairs. It inhabits central and northwest India, Persia, Arabia, Syria, and the greater part of Africa.

The name lynx is given to various species or varieties of animals found in the northern and temperate regions of both the Old and New World, all of moderate size, that is, smaller than the lions, tigers, and leopards, and larger than the true cats, with long limbs, short stumpy tails, ears tufted at the tip, and pupil of the eye linear when contracted. Their fur is generally long and soft, varying, however, according to season and locality, and always longish upon the cheeks. Their color is always light brown or gray, and generally more or less spotted with a darker shade. The naked pads of the feet are more or less covered by the hair that grows between them. The skull and skeleton do not differ markedly from those of the other cats, but the small anterior upper premolar tooth found in many other species is usually wanting. Their habits are exactly those of the other wild cats; they are excelled by none in the untamable savageness of their disposition. They capture their prey in the same manner, either lying in wait, or noiselessly stealing within reach, and then making a sudden rush or spring upon it. Their food consists of

any mammals or birds which they can overpower. In inhabited countries they commit extensive ravages upon sheep, lambs, and poultry. They generally frequent rocky places and forests, being active climbers, and passing much of their time among the branches of the trees. Their skins are of considerable commercial value in the fur trade.

LYONS (French, *Lyons*), in political, commercial, industrial, and military importance, as well as in point of size, the second city of France, formerly the capital of Lyonnais, and now the chief town of the department of Rhone, seat of a court of appeal and of a military government, and a fortified place, is situated at the confluence of the Rhone and the Saône. The population of the city and liberties in 1901 was 453,145. The rivers, both flowing south, are separated by the hill of Croix-Rousse. On the right the Saône is bordered by the scarped heights of Fourvières, St. Irénée, and Ste. Foy, leaving room only for the quays and one or two narrow streets; this is the oldest part of the city. Where it enters Lyons the Saône has on its right the faubourg of Vaise and on its left that of Serin, whence the ascent is made to the top of the hill of Croix-Rousse. The river next takes a semicircular sweep around the hill of Fourvières (410 feet above it), which is fully occupied by convents, hospitals, and seminaries, and has on its summit the famous church, the resort of 1,500,000 pilgrims annually. From this point the best view of the entire city is obtained. First the busy Saône is seen with its thirteen bridges and animated quays. Next, on the peninsula between the two rivers at the foot of the hill of Croix-Rousse, come the principal quarters of the town: the Terreaux, containing the hôtel de ville, the prefecture, and chief commercial establishments; Bellecour with its large open square, one of the finest in Europe; and the aristocratic Quartier de Perrache. The Rhone and Saône formerly met here, till, a hundred years ago, the sculptor Perrache reclaimed from the rivers the quarter which bears his name; on the peninsula thus formed stands the principal railway station. Here too are the docks of the Saône, factories, the arsenal, gas-works, prisons, and the slaughter-house.

The Rhone, less confined than the Saône, flows swiftly in a wide channel, broken when the water is low in spring by pebbly islets. On the right hand it skirts first St. Clair, sloping upward to Croix-Rousse, and then the districts of Terreaux, Bellecour, and Perrache; on the left it has a low-lying plain, subject to disastrous inundations, occupied by the Parc de la Tête d'Or and the quarters of Brotteaux and Guillotière. The park, defended by the Grand Camp embankment, comprises 282 acres, and contains a zoölogical collection, botanical and pharmaceutical gardens, and the finest greenhouses in France, with unique collections of orchids, palm-trees, and *Cycadaceæ*. Brotteaux is a modern town with boulevards and regular streets, and in this direction Lyons is extending every year. In the old districts there is no room for growth; they are crowded with old buildings of eight or ten stories, or even more, and it has been the task of the last thirty years to open them up by means of thoroughfares. Guillotière, to the south, is a workmen's quarter of wretched houses.

The Rhone is lined with broad quays, and crossed by ten fine bridges, two of them for railway traffic. On the right bank stand the lycée and the public library, the Hôtel Dieu, the military hospital, and the Hospice de la Charité; on the left bank is the long range occupied by the medical faculty. In the east of Guillotière the Geneva railway skirts the artillery barracks.

Since 1852 the communes of Croix-Rousse and Guillotière have been united with Lyons. The Rhone and the old fortifications, which, on the right bank of the

Saône, stretched in an unbroken line from the rock of Pierre Scize below Vaise to the bridge of Ainay, continued by those now replaced by the Croix-Rousse boulevard, marked the boundaries of the ancient city. The line of Croix-Rousse has now been thrown forward to the north, and further strengthened by Forts Caluire and Montessuy. On the left bank of the Rhone stand Forts Tête d'Or, Charpenne, Brotteaux, and Part-Dieu, Villeurbanne, Lamotte, Colombier, and Vitriolerie. On the right bank of the Saône Forts Ste. Foy, St. Irénée, Loyasse, Vaise, and Duchère completed the defensive system of Lyons previous to 1870; but since that date the dominant points of the neighborhood have begun to be crowned with batteries and redoubts; but only Forts Brou and Feyzin on the left bank of the Rhone, St. Genis on the right bank, Mont Verdun on Mont d'Or, and Vencia are finished.

St. Martin d'Ainay, in the Perrache quarter, is the oldest church in Lyons, dating from the beginning of the sixth century; the chapels of the apse are adorned by paintings by Flandrin.

Under the Romans Lyons was admirably provided with water. Three ancient aqueducts on the Fourvières level, from Montroman, Mont d'Or, and Mont Pilat, can still be traced; and the last was no less than fifty-two miles long, and capable of supplying 11,000,000 gallons per day. Magnificent remains of this work may be seen at St. Irénée and Chaponost. Traces also exist along the Rhone of a subterranean canal conveying the water of the river to a naumachia. At present the water supply of Lyons is obtained from the Rhone by powerful hydraulic engines situated above the town, which raise the water to the Montessuy and the Fourvières plateaus, 456 feet above the low level of the river. The reservoirs are capable of supplying 1,765,829 cubic feet of water per day.

Agrippa made Lyons the starting-point of the principal Roman roads throughout Gaul; and it still remains an important center in the general system of communication. The Saône above the town and the Rhone below have large barge and steamboat traffic; and the latter river above the town may be used by steamboats during summer as far as Aix in Savoy.

The railway from Paris to Marseilles has two stations (Vaise and Perrache) in Lyons; and the line from Lyons to Geneva two (Brotteaux and St. Clair). The Montbrison line starts from St. Paul, on the right of the Saône. The terminus of Part-Dieu for the newly-opened East of Lyons line is between Perrache and Brotteaux. Within the town there are two rope railways—the first mounting to Fourvières, and the second, popularly called the *ficelle*, from Rue Terme to Croix-Rousse.

In a city of such importance as Lyons the number of industries is naturally large, but by far the most extensive of them all is the silk manufacture. Derived from Italy, this industry rapidly developed under the patronage of Francis I., Henry II., and Henry IV.; and from time to time new kinds of fabrics were invented—silk stuffs woofed with wool or with gold and silver threads, shawls, watered silks, poplins, velvets, satinades, moires, etc. In the beginning of the present century Jacquot introduced his famous loom by which a single workman was enabled to produce elaborate fabrics as easily as the plainest web, and by changing the "cartoons" to make the most different textures on the same looms. In the seventeenth century the silk manufacture employed at Lyons 9,000 to 12,000 looms. After the revocation of the edict of Nantes the number sank to 3,000 or 4,000; but after the Reign of Terror was past it rose again, about 1801, to 12,000. At present there are about 70,000 in operation when no great commercial

crisis comes to diminish production, giving employment to about 140,000 weavers. There are also a large number of persons engaged in the silk-worm hatcheries established in France. The workmen live for the most part in the Croix-Rousse quarter, but many of them inhabit the outskirts. The mean annual value of the silk goods manufactured is estimated at 375,000,000 francs—(\$75,000,000)—250,000,000 representing the value of the raw material and 125,000,000 the value of the labor. Including the purchase of raw materials and the sale of the manufactured goods, the silk trade gives a total turnover of 1,000,000,000 francs (\$200,000,000). A special office (known as *La Condition des Soies*) determines the weight and nature of the silk. Extensive dye-works, chemical works, breweries, pork packing houses, engineering works, printing establishments, and hat factories represent the secondary industries of the place. A large trade is carried on in chestnuts brought from the neighboring departments and known as *marrons de Lyons*.

Lyons was known to the Romans. After having been ravaged by the barbarians and abandoned by the empire, Lyons in 478 became capital of the kingdom of the Burgundians. It afterward fell into the hands of the Franks, and suffered severely from the Saracens, but revived under Charlemagne, and after the death of Charles the Bald was made the capital of the kingdom of Provence. From 1024 it was a fief of the emperor of Germany. Subsequently the superiority over the town was a subject of dispute between the archbishops of Lyons and the counts of Forez; but the royal supremacy was finally established under Louis IX. and Philip the Handsome. The citizens were constituted into a commune ruled by freely elected consuls (1320). In the thirteenth century two ecclesiastical councils were held at Lyons—one in 1245, presided over by Innocent IV., at which the emperor Frederick II. was deposed; the second, the oecumenical, under the presidency of Gregory X., in 1274, at which 500 bishops met. Pope Clement V. was crowned here in 1305, and his successor John XXII. elected in 1316. The Protestants obtained possession of the place in 1562; their acts of violence were fiercely avenged in 1572 after the St. Bartholomew massacre. Under Henry III. Lyons sided with the League; but it pronounced in favor of Henry IV. In 1793 it rose against the Convention, but was compelled to yield to the army of the republic after enduring a siege of seven weeks (October 10th). Terrible chastisement ensued; the name of Lyons was changed to that of Ville-affranchie; the demolition of its buildings was set about on a wholesale scale; and vast numbers of the proscribed, whom the scaffold had spared, were butchered with grape shot. The town resumed its old name after the fall of Robespierre, and the terrorists in their turn were drowned in large numbers in the Rhone. Napoleon rebuilt the Place Bellecour, reopened the churches, and made the bridge of Tilsit over the Saône between Bellecour and the cathedral. In 1814-15 Lyons was occupied by the Austrians, under the government of Louis Philippe, and in 1870-71 there were several bloody émeutes; in 1856 a disastrous flood laid waste the Brotteaux and rendered 20,000 persons homeless. An international exhibition was held here in 1872.

LYONS, a city of Clinton county, Ia., on the Mississippi river, three miles from Clinton. It has good railroad connections, telegraph and banking facilities, and contains several saw-mills, plating-mills, flouring-mills and factories. Lyons occupies a fine position on the bluffs above the river, and is a handsome town, well supplied with schools and churches.

LYONS, EDMUND LYONS, LORD, British admiral, was descended from a family connected with Antigua,

and previously with Cork, and was born at Burton near Christchurch, Hampshire, November 21, 1790. He entered the navy at an early age, and served in the Mediterranean, and afterward in the East Indies, where in 1810 he won promotion by distinguished bravery. He became post-captain in 1814, and in 1828 commanded the *Blonde* frigate at the blockade of Navarino. He took part with the French in the capture of the castle of Morea, receiving for his conduct the orders of St. Louis of France and of the Redeemer of Greece. Shortly before his ship was paid off in 1835 he was knighted. From 1840 till the outbreak of hostilities with Russia Lyons was employed on the diplomatic service, being minister plenipotentiary to the court of Greece until 1849, then until 1851 ambassador to the Swiss cantons, whence he was transferred to a similar position at Stockholm. On the outbreak of the war with Russia he was appointed second in command of the British fleet in the Black Sea under Admiral Dundas, whom he succeeded in the chief command in 1854. He died in 1858.

LYRA, NICOLAUS DE, a well-known mediæval commentator, a native of Lyre, near Evreux, Normandy, was born about 1270, and died in 1340.

LYRE. Of all musical instruments the lyre has been the most associated with poetry, the recitations of Greeks having been accompanied by it. Yet the lyre was not of Greek origin; no root in the language has been discovered for *Lyra*, although the special names bestowed upon varieties of the instrument are Hellenic. We have to seek in Asia the birthplace of the genus, and to infer its introduction into Greece through Thrace or Lydia. The historic heroes and improvers of the lyre were of the Æolian or Ionian colonies, or the adjacent coast bordering on the Lydian empire, while the mythic masters, Orpheus, Museus, and Thamyris were Thracians. Notwithstanding the Hermes tradition of the invention of the lyre in Egypt, the Egyptians seem to have adopted it themselves from Assyria or Babylonia.

The number of strings varied at different epochs, and possibly in different localities—four, seven, and ten having been favorite numbers. They were used without a finger board, no Greek description or representation having ever been met with that can be construed as referring to one. Nor was a bow possible, the flat sound-board being an insuperable impediment. The plectrum, however, was in constant use at all times. It was held in the right hand to set the upper strings in vibration; at other times it hung from the lyre by a ribbon. The fingers of the left hand touched the lower strings.

LYRE-BIRD, the name by which one of the most remarkable feathered inhabitants of Australia is commonly known, the *Menura superba* or *M. nova-hollandie* of ornithologists. First discovered, January 24, 1798, on the other side of the river Nepean, in New South Wales, by an exploring party from Paramatta, under the leadership of one Wilson, a single example was brought into the settlement a few days after, and though called by its finders a "Pheasant"—from its long tail—the more learned of the colony seem to have regarded it as a Bird-of-Paradise. A specimen having reached England in the following year, it was described by General Davies as forming a new genus of birds, in a paper read before the Linnean Society of London, November 4, 1800, and subsequently published in that society's *Transactions*, no attempt, however, being made to fix its systematic place.

LYSANDER was the leading spirit of Lacedæmonian policy at the end of the Peloponnesian War. He is said by Ælian and Athenæus to have been of servile

origin, and by Plutarch to have belonged to a Heraclid family. He first appears in history when sent to command the fleet on the Ionian coast in 407 B.C. The story of his skillful diplomacy, of his influence with Cyrus the younger, of his naval victory at Notium, of his quarrel with his successor Callicratidas in 406, of his reappointment in 405, of the decisive victory at Ægospotami, and of the capitulation of Athens in 404, belongs to the history of Greece. After his return to Sparta his pride and vanity became boundless; he was celebrated by poets, and even worshiped in some places as a god. When King Agis died in 398, Lysander worked to secure the succession for Agesilaus, but after two years he found that he had helped his most dangerous enemy. He began to concert revolutionary schemes, but had not proceeded to any overt act when he was sent with an army into Bœotia. He did not wait the arrival of Pausanias with an auxiliary army, but attacked Haliartus, and was slain in the battle, 395 B.C.

LYSIAS, whose name follows those of Antiphon and Andocides on the list of the ten Attic orators, marks an important stage in the development of Greek literary prose, and is, in his own province, one of its most perfect masters. He never acquired the Athenian citizenship, but most of his years were passed at Athens; and his life has the interest of close personal association with the most critical period in the history of the Athenian democracy.

His extant work belongs to the space from 403 to 380 B.C., but the date of his birth is uncertain. Dionysius of Halicarnassus, and the author of the life ascribed to Plutarch, give 459 B.C. Modern critics would place his birth later—between 444 and 436 B.C.

LYSIMACHUS, son of Agathocles, a Thessalian in the service of Philip of Macedon, was born about 361 B.C. During Alexander's campaigns he was one of his immediate bodyguard; he distinguished himself in India, and was appointed a triarch when Alexander constructed his fleet on the Hydaspes. After the death of Alexander, Lysimachus was appointed to the government of Thrace and the district about the Chersonese. For a long time the Odrysians under their king Seuthes caused him so much trouble that he could take very little part in the struggles of the rival satraps; but in 316 he joined the alliance with Cassander, Ptolemy, and Seleucus made against Antigonus. In 309 he founded Lysimachia in a commanding situation on the neck connecting the Chersonese with the mainland. He followed the example of Antigonus in taking the title of king. When in 302 the second alliance between Cassander, Ptolemy, and Seleucus was made, Lysimachus, reë forced by troops from Cassander, entered Asia Minor, where he met with little resistance. On the approach of Antigonus he retired into winter quarters near Heraclea, marrying its widowed queen Amastris, a Persian princess. Seleucus joined him in 301, and the decisive battle was fought in the plain of Ipsus; Antigonus was slain, and his dominions divided among the victors, Lysimachus receiving the greater part of Asia Minor. Feeling that Seleucus was becoming dangerously great, he now allied himself with Ptolemy, marrying his daughter Arsinoë. In 287 Lysimachus and Pyrrhus invaded Macedon. Demetrius marched against Pyrrhus, thinking the Macedonians would not fight against Lysimachus, one of Alexander's companions in arms; but his army went over to Pyrrhus, and he was obliged to fly. Lysimachus claimed a share of the kingdom and received it. Lysimachus married his daughter Arsinoë to the young Ptolemy Philadelphus. The widow of Agathocles fled to Seleucus, and war between the latter and Lysimachus soon followed. In 281 the decisive battle took place at the plain of Corus,

the exact situation of which is doubtful; Lysimachus was killed.

LYSIPPUS, a Greek sculptor whose professional activity falls between the years 372 and 316 B.C. It is admitted that Lysippus introduced great changes in the accepted rules for the proportions of the human figure, and from a number of sculptures traceable to his time, or shortly after his time, it is not only obvious but strikingly in contrast with earlier works that the legs are made long and massive while the body is proportionately shortened, though still retaining a very powerful rendering of the forms. Among the best examples of this are two bronze statuettes of *Neptune* and *Jupiter* in the British Museum found at Paramythia in Epirus, or, less satisfactory, the larger bronze of *Hercules* from Byblus, also in the British Museum.

LYTE, HENRY FRANCIS, a well-known hymn-writer, was born at Kelso, Ireland, in 1793, and died in 1847.

LYTTELTON, GEORGE, LORD, statesman and man of letters, born at Hagley, Worcestershire, England, in 1709. He died on August 22, 1773.

LYTTON, EDWARD GEORGE EARLE LYTTON BULWER LYTTON, BARON, novelist, dramatist, poet, politician, miscellaneous essayist, the most versatile writer, and one of the most active and widely discursive theorists of his generation, was born in May, 1805, the youngest of the three sons of General Bulwer, of Heydon Hall and Wood Dalling, Norfolk. He was a few months younger than Benjamin Disraeli; the two lives acted not a little one on the other, and offer many curious points of likeness and contrast. Bulwer's father died when he was two years old; the care of the boy devolved on his mother, one of the Lyttons of Knebworth, Hertfordshire, whose name he afterward assumed. To this devoted and accomplished mother he always expressed the warmest gratitude for his early training. He was not sent to a public school; he was educated privately.

In his novels and essays he often discusses the advantages and disadvantages of public schools. One thing is tolerably certain—that if he had been sent to a public school he would not have published at the age of fifteen a volume of poems (*Ismael, an Oriental Tale, with Other Poems*, 1820). At Cambridge, in 1825, Bulwer won the chancellor's medal with a poem on "Sculpture." In 1826 he printed for private circulation *Weeds and Wild Flowers*. In 1827 he published *O'Neill, or the Rebel*, a romance, in heroic couplets, of patriotic struggle in Ireland, dedicated to Lady Blessington. These juvenilia, and also a metrical satire, *The Siamese Twins*, issued in 1831, he afterward ignored, describing *The New Timon* as his first publication in verse, with the exception of his dramas and translations from Schiller.

Bulwer's first romance, *Falkland*, published anonymously in 1827, was in the vein of fantastic German romance popular at the beginning of the century, and did not bring him the fame that he coveted so ardently. It was otherwise with *Pelham*, published in the following year. In this he went with the native stream of fiction, and at once made himself felt as a power. *Pelham* was followed in quick succession by *The Disowned* (1828), *Devereux* (1829), *Paul Clifford* (1830), *Eugene Aram* and *Godolphin* (1833). Bulwer was deeply impressed with German theories of art; all these novels were novels with a purpose, moral purpose, psychological purpose, historical purpose. Bulwer was more successful in another attempt to break new ground in *The Last Days of Pompeii* (1834) and *Rienzi* (1835). No historical romances dealing with times and scenes so remote were ever more widely popular in England, and in aiming at popularity the author labored hard to

secure historical accuracy. In *Athens, its Rise and Fall* (1836), we received in the form of historical essays what had probably been acquired industriously as materials for romance. Two romances from Spanish history, *Leila and Calderon*, published in 1838, aimed at a less realistic treatment, and, with all their purely literary excellences, were not so popular. In *Ernest Maltravers* (1837) and its sequel *Alice, or The Mysteries* (1838), the novelist returned to English ground and psychological and social problems—"the affliction of the good, the triumph of the unprincipled."

To his other literary labors Bulwer superadded for some time the editorship of a magazine. He succeeded Campbell as editor of *The New Monthly* in 1833. In 1838 he projected a magazine called *The Monthly Chronicle*, and contributed to it as a serial story the fantastic romance, *Zicci*. The magazine expired before the story was completed, and it afterward developed into *Zanoni*, a romance of which he was himself especially proud, and which suffered in public estimation from being tried by realistic standards.

During the most productive period of his literary life Bulwer was a member of parliament. He was returned for St. Ives in 1831, and sat for Lincoln from 1832 to 1841. He spoke in favor of the Reform Bill, and took a leading part, in obtaining the reduction, after vainly trying to procure the repeal, of the newspaper stamp duties. His support of the Whigs in parliament, and by a pamphlet on "the crisis" when they were dismissed from office in 1834, was considered so valuable that Lord Melbourne offered him a place in the administration. His intimacy with Radical leaders at this period exposed him to an undeserved charge of tergiversation when later in life he was a member of a Conservative Government.

There was a slight break in Bulwer's career as a novelist between 1838 and 1847. During this interval he applied himself enthusiastically to play-writing—Macready's management of Covent Garden having inspired men of letters with the hope of reconciling poetry with the stage. In 1836 he had produced *The Duchess of La Vallière*. It was a failure. But in 1838 and the two following years he produced three plays which have kept the stage ever since—*The Lady of Lyons*, *Richelieu*, and *Money*. In his plays, as in his novels, definite theory preceded execution. The principles on which he wrote his plays were laid down in his chapter on the drama in *England and the English*. Thirty years afterward, in 1869, he turned his thoughts again to writing for the stage, recast an old failure with a new title, *The Rightful Heir*, and produced a new comedy, *Walpole*. Neither was a success.

From 1841 to 1852 Bulwer (he assumed his mother's name of Lytton on succeeding to her estates in 1843) had no seat in parliament. But the issue of novels and romances was not so rapid as it had been in the full energy of his youth. Before 1849, when he opened a new vein with *The Caxtons*, he produced five works in his familiar vein:—*Night and Morning* (1841, in which the influence of Dickens is traceable), *Zanoni* (1842), *The Last of the Barons* (1843, the most historically solid, and perhaps the most effective of his romances), *Lucrétia*, or

the Children of the Night (1847); *Harold, The Last of the Saxon Kings* (1848).

The cause of the comparative infertility of this period in prose fiction probably was that Lytton was now making a determined effort to win high rank as a poet. He published a volume of poems in 1842, a volume of translations from Schiller in 1844, *The New Timon*, a satire, in 1845. Then came the work on which mainly Lytton rested his pretensions, *King Arthur*, a romantic epic. It fell flat. The verse, the six-lined stave of elegiac quatrain and couplet, lacks charm and variety; the incidents are monotonous, the personages uninteresting, the plot unexciting, and the allegory obscure. *St. Stephen's*, a gallery of parliamentary portraits from the time of Queen Anne, was a kind of metrical composition that lay more within his powers. In this the satire is keen-edged, the admiration just and generous. It was published in 1860. The *Lost Tales of Miletus* (1866) and a translation of Horace's *Odes* (1869) were Lytton's last essays in verse.

In the skill with which he sustained a new style in *The Caxtons* (1848) Lytton gave a more convincing proof of his versatility. This imitation of Sterne (by no means a servile imitation, rather an adaptation of Sterne's style and characters to the circumstances of the nineteenth century) appeared anonymously in *Blackwood's Magazine*, and made a reputation before the authorship was suspected. *My Novel* (1853) and *What will He Do with It?* (1858) continued in the same strain.

Lytton returned to parliament in 1852 as member for Hertfordshire, and sat on the Conservative side. Early in life he had decided in his mind against the reduction of the corn duties, and, unchanged in 1851, he addressed a "Letter to John Bull," enlarging on the dangers of their repeal. He was colonial secretary in Lord Derby's Government from 1858 to 1859, and threw himself industriously into the duties of his office. He was raised to the peerage as Baron Lytton in 1866.

That he had not forgotten his power of moving the sense of melodramatic and romantic mystery when he adopted the more subdued style of *The Caxtons*, Lytton proved by *A Strange Story*, contributed to *All the Year Round* in 1862. A serial story of the kind made a new call on his resources, but he was equal to it, and fairly rivaled the school of Dickens in the art of sustaining thrilling interest to the close.

When he died, in January, 1873, after a short, painful illness, two works of high repute, *The Coming Race* and *The Parisians*, were not acknowledged, and were only vaguely suspected to be his. They had freshness enough to be the work of youth, and power enough to shame no veteran. These two books, the fable and the novel, are classed by Lytton's son and successor in the title with the romance of *Kenelm Chillingly*, left completed at his death, as forming a trilogy, animated by a common purpose, to exhibit the influence of "modern ideas" upon character and conduct.

Lord Lytton married in 1827 Miss Rosina Wheeler, an Irish lady, of considerable talent. Their married life was a most wretched one and culminated in a divorce. Lady Lytton wrote a number of novels, in which she satirized her husband under various characters.

M.

M. The letter M denotes a nasal sound, which varies little, if at all, in different languages. Nasal sounds are produced as follows:—The breath—turned into voice at its passage through the glottis—does not pass out wholly through the mouth. Part of it is diverted behind the soft palate, and so through the nostrils; the remainder passes through the mouth-cavity, and is there completely checked at some point of its course. When that check is taken away, we hear, not the sonant which would have been produced if all the breath had passed through the mouth, but a nasal varying in nature according to the part of the cavity where the check of the tongue or the lips has been applied. There may be as many definite nasal sounds in any language as there are recognized classes of consonants, as guttural, palatal, dental, labial. In Sanskrit there were even five nasal sounds so clearly differentiated that each had a special symbol to denote it; the cerebral class of sounds (produced by turning the tip of the tongue slightly back against the middle of the palate) had its nasal as well as each of the other four classes above mentioned. In English we have three sounds, but only two simple symbols, *m* and *n*; for the guttural nasal heard in *sing*, etc., we employ the diagraph *ng*. Spanish has a palatal nasal.

The nasal sound denoted by M is the labial nasal. It corresponds to the sonant *b*-sound; for each of them the lips are completely closed, and if no voice were diverted through the nostrils a *b*-sound only would be heard when the lips are opened; all the organs of the mouth are in exactly the same position for one sound as for the other, but, the soft palate being lowered, the voice is divided in its egress. Hence we see why a man who has a cold pronounces *m* as *b*; the voice cannot get through the nostrils, which are blocked up; it must therefore escape mainly or entirely through the lips, and so produce a *b*-sound. Therefore, instead of "talking through his nose," as the phrase goes, such a person tries to talk through his nose but cannot. The symbol M stands in numeration for 1,000.

MAAS. See MEUSE.

MABILLON, JEAN, the learned and discriminating historian of the Benedictine order, was born at the village of Saint Pierremont, Champagne (now in the department of Ardennes), in 1632, and died in 1707.

MABINOIGION. See CELTIC LITERATURE.

MABUSE. See GOSSART.

MACAO, a Portuguese settlement on the coast of China, consists of a tongue of land one and a half square miles in extent, running south-southwest from the island of Hiang Shang (Portuguese, Ançam), on the western side of the estuary of the Canton river. Bold and rocky hills, about 300 feet in height, occupy both extremities of the peninsula, the picturesque-looking city, with its flat-roofed houses painted blue, green, and red, lying in the far from level stretch of ground between. The forts are effective additions to the general view, but do not add much to the real strength of the place.

In 1896 there were in Macao 3,106 persons of European birth or extraction, 74,568 Chinese living on land, and 10,268 in boats. Half-castes are very numerous. Though most of the land is under garden cultivation, the mass of the people is dependent more or less directly on mercantile pursuits; for, while the exclusive policy both of Chinese and Portuguese which prevented Macao becoming a free port till 1845-46 allowed what was once the great emporium of European commerce in eastern Asia to be outstripped by its younger and more liberal rivals, the trade of the place is still of very considerable extent.

MACARONI (from dialectic Italian *maccare*, "to bruise or crush") is a preparation of wheat originally peculiar to Italy, in which country it is an article of food of national importance. The same substance in different forms is also known as vermicelli, pasta or Italian pastes, taglioni, fanti, etc. These substances are prepared from the hard semi-translucent varieties of wheat which are largely cultivated in the south of Europe, Algeria, and other warm regions, and which are distinguished by the Italians as *grano duro* or *grano da semolino*.

MACARTNEY, GEORGE MACARTNEY, EARL OF, was descended from an old Scotch family, the Macartneys of Auchinleck, who had settled in 1649 at Lissanoure, Antrim, Ireland, where he was born May 13, 1737. After graduating at Trinity College, Dublin, in 1759, he became a student of the Inner Temple, London. Appointed envoy-extraordinary to Russia in 1764, he succeeded in negotiating an alliance between England and that country. After for some time occupying a seat in the English parliament, he was in 1769 returned for Armagh in the Irish parliament, in order to discharge the duties of chief secretary for Ireland. On resigning this office he received the honor of knighthood. In 1775 he became governor of Granada, in 1780 governor of Madras, and in 1785 he was appointed governor-general of Bengal, but, his health demanding his return to England, he declined to accept office. After being created earl of Macartney in the Irish peerage, he was appointed in 1792 the first envoy of Britain to China. On his return from a confidential mission to Italy he was raised to the English peerage in 1796, and in the end of the same year was appointed governor of the newly acquired territory of the Cape of Good Hope, where he remained till ill-health compelled him to resign in November, 1798. He died at Chiswick, Surrey, March 31, 1806.

MACASSAR. See CELEBES.

MACAULAY, THOMAS BABINGTON MACAULAY, LORD, was born at Rothley Temple, Leicestershire, on October 25, 1800. His father Zachary Macaulay, had been governor of Sierra Leone, and was in 1800 secretary to the chartered company who had founded that colony. The boy at a very early age gave proof of a determined bent toward literature. Before he was eight years of age he had written a *Compendium of Universal History*, which gave a tolerably connected

view of the leading events from the Creation to 1800, and a romance in the style of Scott, in three cantos, called the *Battle of Cheviot*. At a little later time the child composed a long poem on the history of Olaus Magnus, and a vast pile of blank verse entitled *Fingal, a Poem in Twelve Books*.

In October, 1818, young Macaulay went into residence at Trinity College, Cambridge. In 1826 Macaulay was called to the bar and joined the northern circuit. But after the first year or two, during which he got no business worth mention, he gave up even the pretense of reading law, and spent many more hours under the gallery of the House of Commons than in the court. His first attempt at a public speech, made at an anti-slavery meeting in 1824, was described by the *Edinburgh Review* as "a display of eloquence of rare and matured excellence." His first considerable appearance in print was in No. I. of Knight's *Quarterly Magazine*, a periodical which enjoyed a short but brilliant existence, and which was largely supported by Eton and Cambridge. In August, 1825, began Macaulay's connection with the periodical which was to prove the field of his literary reputation. The *Edinburgh Review* was at this time at the height of power, not only as an organ of the growing opinion which leaned toward reform, but as a literary tribunal from which there was no appeal. The essay on Milton, though so crude that the author said of it that "it contained scarcely a paragraph such as his matured judgment approved," created for him at once a literary reputation which suffered no diminution to the last, a reputation which he established and confirmed, but which it would have been hardly possible to make more conspicuous. Murray declared that it would be worth the copyright of *Childe Harold* to have Macaulay on the staff of the *Quarterly Review*.

At the university Macaulay had been recognized as preëminent for talk and companionship among a circle of young men of talents so brilliant as were Charles Austin, Romilly, Præd, Villiers, and others. He now displayed these gifts on a wider theater. Crabb Robinson's diary, under date 1826, records the judgment of one who had been in the constant habit of hearing the best talk of the London of his day.

Thus launched (1825) on the best that London had to give in the way of society, Macaulay accepted and enjoyed with all the zest of youth and a vigorous nature the opportunities opened for him. He was courted and admired by the most distinguished personages of the day.

But the shadow of pecuniary trouble early began to fall upon his path. Commercial disaster overtook the house of Babington & Macaulay, and the son now saw himself compelled to work for his livelihood. His Trinity fellowship of £300 a year became of great consequence to him, but it expired in 1831; he could make at most £200 a year by writing; and a commissionership of bankruptcy, which was given him by Lord Lyndhurst in 1828, and which brought him in about £400 a year, was swept away, without compensation, by the ministry which came into power in 1830. Macaulay now found himself a poor man, and was reduced to such straits that he had to sell his Cambridge gold medal.

In February, 1830, the doors of the House of Commons were opened to him in the only way in which a man without fortune could enter them, through what was then called a "pocket borough." Lord Lansdowne, who had been struck by two articles on Mill (James) and the Utilitarians, which appeared in the *Edinburgh Review* in 1829, offered the author the seat at Calne. The offer was accompanied by the express assurance

that the noble patron had no wish to interfere with his freedom of voting. He thus entered parliament at one of the most exciting moments of English domestic history, when the compact phalanx of reactionary administration which for nearly fifty years had commanded a crushing majority in the Commons was on the point of being broken by the growing strength of the party of reform. Macaulay made his maiden speech on April 5, 1830, on the second reading of the bill for the removal of Jewish disabilities. In July the king died and parliament was dissolved; the revolution took place in Paris. Macaulay, who was again returned for Calne, visited Paris. On March 1, 1831, the Reform Bill was introduced, and on the second night of the debate, Macaulay made the first of his reform speeches. It was a signal success. Sir Robert Peel said of it that "portions were as beautiful as anything I have ever heard or read."

On the triumph of Earl Grey's cabinet, and the passing of the Reform Act, in June, 1832, Macaulay, whose eloquence had signalized every stage of the conflict, became one of the commissioners of the Board of Control, and applied himself to the study of Indian affairs. His industry was untiring, and the amount of intellectual product which he threw off very great. Giving his days to India and his nights to the House of Commons, he could only devote a few hours to literary composition by rising at five when the business of the House had allowed of his getting to bed in time on the previous evening. Between September, 1831, and December, 1833, he furnished the *Review* with the following articles: "Boswell's Life of Johnson," "Lord Nugent's Hampden," "Burleigh and his Times," "Mirabeau," "Horace Walpole," "Lord Chatham," besides writing his ballad on the Armada for one of the Albums.

In the first reform parliament, January, 1833, Macaulay took his seat as one of the first two members for Leeds, which up to that date had been unrepresented in the House of Commons. He replied to O'Connell in the debate on the address. In July he defended the Government India Bill in a speech of great power, and to his aid was greatly due the getting the bill through the committee without unnecessary friction.

In 1833 he accepted the offer which was made him of a seat in the supreme council of India, a body which had been created by the India Act he had himself been instrumental in passing. The salary of the office was fixed at £10,000, an income out of which he calculated to be able to save in five years a capital of £30,000. His sister Hannah accepted his proposal to accompany him, and in February, 1834, the brother and sister sailed for Calcutta.

Macaulay's appointment to India occurred at the critical moment when the government of the company was being superseded by government by the crown. His knowledge of India was, when he landed, but superficial. Macaulay's presence in the council was of great value; his minutes are models of good judgment and practical sagacity. The part he took in India has been described as "the application of sound liberal principles to a government which had till then been jealous, close, and repressive." He vindicated the liberty of the press; he maintained the equality of Europeans and natives before the law; and as president of the committee of public instruction he inaugurated that system of national education which has since spread over the whole of the Indian peninsula.

A clause in the Indian Act of 1833 occasioned the appointment of a commission to inquire into the jurisprudence of the Eastern empire. Macaulay was appointed president of that commission. The draft of a penal code which he submitted became, after a revision

of many years, and by the labor of many experienced lawyers, that criminal code under which law is now administered throughout the empire.

In 1838 Macaulay and his sister Hannah, who had now become Lady Trevelyan, returned to England. He at once entered parliament as member for Edinburgh. In 1839 he became secretary of war, with a seat in the cabinet in Lord Melbourne's ministry. His acceptance of office diverted him for a time from prosecuting the plan he had already formed of a great historical work. But only for a time. In less than two years the Melbourne ministry fell, and Macaulay was liberated from having to support a government wretchedly weak, and maintaining its struggle for bare existence.

He returned to office in 1846, in Lord John Russell's administration. But it was in an office which gave him leisure and quiet rather than salary and power—that of paymaster-general. His duties were very light, and the contact with official life and the obligations of parliamentary attendance were even of benefit to him while he was engaged upon his *History*. In the sessions of 1846-47 he spoke only five times, and at the general election of July, 1847, he lost his seat for Edinburgh upon issues which did not reflect credit upon that constituency. Macaulay retired into private life, not only without regret, but with a sense of relief.

Great as was his enjoyment of literary society and books, they only formed his recreation. In these years he was working with unflagging industry on the composition of his *History*. His composition was slow, his corrections of both matter and style endless; he spared no research to ascertain the facts. He sacrificed to the prosecution of his task a political career, House of Commons fame, the allurements of society. The first two volumes of the *History of England* appeared in December, 1848. The success was in every way complete beyond expectation. The sale of edition after edition, both in England and the United States, was enormous.

In 1852, when his party returned to office, he refused a seat in the cabinet, but he could not bring himself to decline accepting the compliment of a voluntary amende which the city of Edinburgh paid him in returning him at the head of the poll at the general election in July of that year. He had hardly accepted the summons to return to parliamentary life before he was struck down by the malady which in the end proved fatal. This first betrayed itself in deranged action of the heart; from this time forward till his death his strength continued steadily to sink. The process carried with it dejection of spirits as its inevitable attendant. The thought oppressed him that the great work to which he had devoted himself would remain a fragment. Once again, in June, 1853, he spoke in parliament, and with effect, against the exclusion of the Master of the Rolls from the House of Commons, and at a later date in defense of competition for the Indian civil service. But he was aware that it was a grievous waste of his small stock of force, and that he made these efforts at the cost of more valuable work.

In November, 1855, vols. iii. and iv. of the *History* appeared. No work, not being one of amusement, has in our day reached a circulation so vast. In the United States few books except the Bible ever had such a sale. On the Continent of Europe, the sale of Tauchnitz' editions was very large, a sale which did not prevent six rival translations in German. The *History* has been published in the Polish, Danish, Swedish, Hungarian, Russian, Bohemian, Italian, French, Dutch, and Spanish languages. Flattering marks of respect were heaped upon the author by the foreign Academies. His pecuniary profits were on a scale commensurate

with the reputation of the book; the check for £20,000 (\$100,000) has become a landmark in literary history.

In 1857 he was raised to the peerage by the title of Baron Macaulay of Rothley. The distinction came just not too late. Macaulay's health, which had begun to give way in 1852, was every year visibly failing. In the Upper House he never spoke. Absorbed in the prosecution of his historical work, he had grown indifferent to the party politics of his own day. Gradually he had to acquiesce in the conviction that, though his intellectual powers remained to him unimpaired, his physical energies would not carry him through the reign of Anne; and, though he brought down the narrative to the death of William III., the last half volume wants the finish and completeness of the earlier portions. The winter of 1859 was very severe, and hastened the end. He died on December 28th, and on January 9, 1860, was buried in Westminster Abbey, in Poet's Corner, near the statue of Addison.

MACAW, or, as formerly spelt, MACCAW, the name given to some fifteen or more species of large, long-tailed birds of the Parrot family, natives of the Neotropical Region, and forming a very well-known and easily-recognized group to which the generic designation *Ara* is usually applied by ornithologists, though some prefer for it *Macrocerus* or *Sittace*. Most of the Macaws are remarkable for their gaudy plumage, which exhibits the brightest scarlet, yellow, blue, and green in varying proportion and often in violent contrast, while a white visage often adds a very peculiar and expressive character. With one exception the known species of *Ara* inhabit the mainland of America from Paraguay to Mexico, being especially abundant in Bolivia, where no fewer than seven of them (or nearly one-half) have been found.

The blue and yellow Macaw, *A. ararauna*, has an extensive range in South America from Guiana in the east to Columbia in the west, and southward to Paraguay. Of large size, it is a bird to be seen in almost every zoological garden, and is frequently kept alive in private houses, for its temper is pretty good and it will frequently become strongly attached to those who tend it. Its richly-colored plumage, sufficiently indicated by its common English name, has the additional recommendation of supplying feathers which are eagerly sought by salmon-fishers for the making of artificial flies. Next may be mentioned the Red-and-blue Macaw, *A. macao*, which is even larger and more gorgeously clothed, for, besides the colors expressed in its ordinary appellation, yellow and green enter into its adornment. It inhabits Central as well as South America as far as Bolivia, and is also a common bird in captivity, though perhaps less often seen than the foregoing. The Red-and-yellow species, *A. chloroptera*, ranging from Panama to Brazil, is smaller, or at least has a shorter tail, and is not so usually met with in menageries. The Red-and-green, *A. militaris*, smaller again than the last, is not infrequent in confinement, and presents the colors of the name it bears. This has the most northerly extension of habitat, occurring in Mexico and thence southward to Bolivia.

MACBETH, MACBETHAD, or MACBEDA, son of Finnlach, was king of Scotland from 1040 to 1057. He had previously been "mormaer" of Moravia or Moray; and his predecessor on the throne was Duncan, son of Crinan, and grandson of Malcolm, whom he slew (according to some accounts at "Bothgowan," said to have been near Elgin). Macbeth's wife was Gruoch, a descendant of the royal house. Of the events of his reign almost nothing is known. The ecclesiastical records of St. Andrew bear that he and his wife, "rex et regina

Scotorum," made over lands certain to the Culdees of Lochleven; and in 1050 he appears to have visited Rome, perhaps to obtain absolution for the murder of Duncan. The sons of Duncan who had taken refuge with their uncle Siward, earl of Northumberland, brought about an invasion of Scotland in 1054; a battle was fought at Dunsinane with indecisive results, but three years afterward Macbeth fell at Lumphanan in Aberdeenshire (August 15, 1057). The war was continued for some time in the interest of a certain Lulach, the son of Queen Gruoch by a former marriage; but he too was slain in Strathbogie in March, 1058, and Malcolm, the son of Duncan, ascended the throne.

MACCABEES. The name Maccabee is properly and originally the distinguishing surname of Judas, son of Mattathias, the first great hero of the Jewish revolt against Antiochus Epiphanes. The source of the name is uncertain, but it is most natural to connect it with *Makab*, "hammer." Ewald is doubtless right in arguing from 1 Mac. vi. 43, etc., that the surnames of the sons of Mattathias were simply distinguishing epithets which they bore in ordinary life, and in this light "hammerman" appears as a natural surname enough, the occasion of which it would be vain to inquire into. From Judas the name was in later times extended to the whole family, or to the party it represented, or even, as in the title 3 Maccabees, to other contenders or sufferers for the faith of Israel in the Greek period. The more correct name of the family was Hasmoneans.

MACCABEES, BOOKS OF. Two books of this name are included among the Apocrypha of the English Bible, as they had formerly been in the Vulgate, and were accepted as canonical by the council of Trent. A third book is usually included in editions of the Septuagint, and is found in common with books iv. and v. in the Syriac, but never took a place in Latin Bibles; a fourth is found in some MSS. of the Septuagint (including the Sinaitic and Alexandrian—the Vatican does not contain the Maccabee books) and also in MSS. of Josephus, and has been printed in both connections.

I. *Maccabees* was originally written in Hebrew, as appears, not only from the testimony of Jerome, who had seen the Hebrew text, but from internal evidence. Josephus, however, already used the Greek, and no trace of the Semitic original survives except the problematical title recorded by Origen. The book gives the history of the national movement in Judæa from the accession of Antiochus Epiphanes (175 B.C.) to the murder of Simon (135 B.C.), in a plain and honest style, and evidently from good information.

II. *Maccabees*, covering the history from 176 B.C. to the victory over Nicanor (160 B.C.), is much inferior in value. It begins with two epistles which are certainly forgeries, and then proceeds to the task of summarizing in one book the five books of a certain Jason of Cyrene on the war of liberation against Antiochus Epiphanes. The narrative is a useful supplement to that in the first book, but is not nearly so trustworthy, and can never claim the preference where the two are in conflict.

III. *Maccabees* records a persecution of the Alexandrian Jews by Ptolemy IV. Philopator, with the ultimate repentance of the tyrant. It is quite unhistorical, and the local feasts of the Alexandrian Jews, of which it professes to explain the origin, is connected by Josephus with an event that took place under Ptolemy Physcon. Ewald's conjecture that the story contains a hidden reference to the emperor Caius has found considerable favor. It seems strange that this book should ever have found entrance in Christian circles. It had, however, considerable acceptance in the Eastern Church.

IV. *Maccabees*, also known by the title "on the sovereignty of reason," was ascribed to Josephus by Eusebius

and Jerome. This opinion is now given up, and nothing certain can be said of its origin. It is a not uninteresting specimen of a Jewish philosophical theme composed under Stoic influence. The author illustrates the sovereignty of pious reason over the passions by historical examples, and is thus led to give anecdotes from the time of the Maccabees.

MACCLESFIELD, a municipal and parliamentary borough and market-town of Cheshire, England, is situated seventeen miles south-southeast of Manchester, and thirty-seven east-northeast of Chester. Population (1901), about 45,000.

M'CLURE, SIR ROBERT JOHN LE MESURIER, the discoverer of the Northwest Passage, was born at Wexford, Ireland, January 28, 1807, and died in London, October 17, 1873. Schooled in Arctic exploration by his service under Captain Back on board the *Terror*, he was first lieutenant of the *Enterprise* during the Franklin search expedition (1848-49), and in 1850 was placed in command of the expedition which, battling with the frozen sea for four years, succeeded in passing from ocean to ocean to the north of the American continent. M'Clure was knighted on his return, and received gold medals from the English and the French geographical societies. During the Canadian insurrections of 1836-38 he had performed some gallant exploits on the lakes—on one occasion, in the eagerness of pursuit, infringing the territory of the United States; and between 1856 and 1861 he rendered good service in the Chinese war at the storming of Canton, etc. His latter years were spent in a quiet country life. He was appointed Commander of the Bath in 1859, and had attained the rank of vice-admiral on the retired list.

M'CRIE, THOMAS, historian and miscellaneous writer, was born at Dunse or Duns, in Berwickshire, Scotland, in 1772. He died in 1835.

MACCULLAGH, JAMES, one of the leading geometers of modern times, was born in 1809, near Strabane, Ireland. His *Works* have been published in a collected form (Dublin University Press Series, 1880). Their distinguishing feature is the geometry—which has rarely been applied either to pure space problems or to known physical questions such as the rotation of a rigid solid or the properties of Fresnel's wave-surface with such singular elegance. In this respect his work takes rank with that of Poincaré. No higher praise could be given. He died in 1846.

MACCULLOCH, HORATIO, Scotch landscape painter, was born in Glasgow in 1805. In 1829 Macculloch first figured in the Royal Scottish Academy's exhibition, with a *View of the Clyde*, and, year by year, till his death on June 24, 1867, he was a liberal contributor to its displays.

MACCULLOCH, JOHN, one of the most eminent geologists of his time, was born in Guernsey, October 6, 1773, his mother being a native of that island. Having displayed remarkable powers as a boy, he was sent to study medicine in the university of Edinburgh, took his diploma there, and entered the army as assistant surgeon. Attaching himself to the artillery, he became chemist to the Board of Ordnance (1803), and thus began relations with the government which materially affected his future career. In the year 1811 he communicated his first papers to the Geological Society. They were devoted to an elucidation of the geological structure of Guernsey, of the Channel Islands, and of Heligoland. The evidence they afforded of his capacity, and the fact that he already had received a scientific appointment, probably led to his being selected by government to make some geological and mineralogical investigations in Scotland. One of his earliest and most important labors was the examination of the whole range of

islands along the west of Scotland, at that time not easily visited, and presenting many obstacles to a scientific explorer. The results of this survey appeared (1819) in the form of his *Description of the Western Islands of Scotland, Including the Isle of Man* (2 vols. 8vo, with an atlas of plates in 4to), which forms one of the classical treatises on British geology. He lived to complete this great labor, but died in 1836.

M'CULLOCH, JOHN RAMSAY, a distinguished writer on political economy and statistics, was born at Whitehorn, in Wigtownshire, Scotland, 1779. Died, 1864.

MACDONALD, ÉTIENNE-JACQUES-JOSEPH-ALEXANDRE, duke of Taranto, and marshal of France, was born at Sancerre, November 17, 1765. His father came of an old Jacobite family, which had followed James II. to France, and was a near relative of the celebrated Flora Macdonald (1722-1790), the heroine whose courage and fidelity were at one critical period the sole means by which Prince Charles Edward was enabled to elude his enemies after the defeat of Culloden in 1746. In 1784 Macdonald joined the legion raised by the second Marshal Maillebois to support the revolutionary party in Holland against the Prussians, and after it was disbanded he received a commission in the regiment of Dillon. He distinguished himself at Jemmapes, and was promoted colonel in 1794. He refused to desert to the Austrians with Dumouriez, and as a reward was made general of brigade, and appointed to command the leading brigade in Pichegru's invasion of Holland. In 1797 he was made general of division, and transferred first to the army of the Rhine and then to that of Italy. When he reached Italy the peace of Campo Formio had been signed, and General Bonaparte had returned to France; but under the direction of Berthier, Macdonald first occupied Rome, of which he was made governor, and then in conjunction with Championnet he defeated General Mack, and revolutionized the kingdom of Naples under the title of the Parthenopæan Republic. When Suwaroff invaded northern Italy, and was winning back the conquests of Bonaparte, General Macdonald collected all the troops in the peninsula and moved northward. With but 30,000 men he attacked, at the Trebbia, Suwaroff with 50,000, and after three days' fighting, during which he held the Russians at bay, and gave time for Moreau to come up, he retired in good order to Genoa. After this gallant behavior he was made governor of Versailles, and acquiesced in, if he did not coöperate in, the events of the 18th Brumaire. In 1800 he received the command of the army in Switzerland, which was to maintain the communications between the armies of Germany and of Italy. He carried out his orders to the letter, and at last, in the winter of 1800-1, he was ordered to march over the Splügen Pass. This achievement is fully described by Mathieu Dumas, who was chief of his staff, and is at least as noteworthy as Bonaparte's famous passage of the Saint Bernard before Marengo, though followed by no such successful battle. On his return to Paris he married the widow of General Joubert, and was appointed French plenipotentiary in Denmark. Returning in 1805, he associated himself with Moreau, and incurred the dislike of Napoleon, who did not include him in his first creation of marshals. Till 1809 he remained without employment, but in that year Napoleon, hard pressed at Aspern, gave Macdonald the command of a division in the army of the viceroy of Italy which was to march from Italy to his help. He led the army from Italy till its junction with Napoleon, and at Wagram commanded the attack on the Austrian center which won the victory. Napoleon made him marshal of France on the field of battle, and created him duke of Taranto. In 1810 he served in Spain, and

in 1812 he commanded the left wing of the grand army for the invasion of Russia. After sharing in the battles of Lützen and Bautzen, he was ordered to invade Silesia, where Blücher defeated him with great loss at the Katzbach. After the terrible battle of Leipsic, he was ordered with Prince Poniatowski to cover the evacuation of Leipsic, and after the blowing up of the bridge, he managed to swim the Elster, while Poniatowski was drowned. During the defensive campaign of 1814, Macdonald again distinguished himself, and was one of the marshals sent by Napoleon to take his abdication in favor of his son to Paris. When all were deserting their old master, Macdonald remained faithful to him. Macdonald was directed by Napoleon to give in his adherence to the new régime, and was presented by him with the saber of Murat Bey for his fidelity. He was made a peer of France at the Restoration, and, having once passed his word to the new order of things, remained faithful during the Hundred Days. In 1816 he became chancellor of the Legion of Honor, a post he held till 1831 and took a great part in the discussions in the House of Peers. In 1823 he married Mademoiselle de Bourgoing, and at last had a son, Alexander, who succeeded on his death in 1840 as duke of Taranto.

MACDONALD, LAWRENCE, sculptor, was born at Gask, Perthshire, Scotland, 1798. Died, 1878.

MACEDONIA, when that name is taken in its widest signification, is the country between Thrace on the east and Illyria on the west, bounded on the south by Thessaly and the Ægean Sea, and on the north by the lands which belong to the basin of the Danube. The most definite limit in its physical geography is that toward Illyria, where the Scardus range, which still bears the name of *Schar* forms a continuous barrier between the two countries; on the side of Thessaly also, Mount Olympus and the Cambanian mountains constitute a well-marked frontier. In the other two directions its natural limits are less clearly defined. Toward the east, during the greater part of its history, the river Strymon was regarded as its proper boundary; but after the foundation of the city of Philippi it encroached on Thrace, and extended as far as the river Nestus, or even Mount Rhodope. With regard to the features of the country immediately to the north of Macedonia a misconception long prevailed, which has only of late years been dispelled by geographical research. Owing to a misinterpretation of a passage in Strabo, it was long believed that the country between the Danube and the Ægean was divided in the middle by a lofty range of mountains, which formed a continuation of the main chain of the Alps as far as the Euxine; and this mistake is perpetuated in many maps at the present day. But since this district has been explored, first by Grisebach, and afterward by Von Hahn, it has been known that along one important portion of this supposed line, directly to the north of Macedonia and southeast of the modern principality of Servia, the hills do not rise to any considerable elevation, and that affluents of the Margus (Morava), which flows into the Danube, and of the Axios (Vardar), which runs to the Ægean, rise close together in the upland plain of Kossova, the scene of the great battle in which the Servian monarchy was overthrown by Sultan Amurath I. in 1380. This watershed may be regarded as the northern boundary of Macedonia. But the extended limits which have here been given did not belong to the district that bore that name in early times. The original Macedonia was confined to the inland region west of the Axios, between that river and the Scardus mountains, and did not include the northern portion which was known as Pæonia, or the coast-land which, together with the eastern districts, was inhabited by Thracian

tribes, and was regarded by the Greeks at the time of the Peloponnesian war as part of Thrace. The people of this country were not Hellenic, though its rulers ultimately succeeded in claiming that title for themselves, at the time when Alexander I. was admitted as a competitor at the Olympic games. The same thing may be said of the land itself, the appearance of which presents many points of contrast to that of Greece proper. Instead of the delicate, bright, and varied scenery of that country, with its clear atmosphere and sharp outlines, we find in Macedonia broad masses of mountains, extensive sweeps of lowland, and uniformity of color. The climate of the inland regions also is severe, so that the cypress and other trees which flourish in Greece will not grow there.

MACEDONIAN EMPIRE, THE. The attention of the Greeks was drawn at an early time to the danger that the northern tribes might combine to invade the south. Sitalces, king of Thrace, spread great alarm by an inroad during the Peloponnesian War, but the real peril was from Macedonia rather than from Thrace. The Macedonians had been gradually pushing their way down toward the coast, and, though Alexander I. was a vassal of Xerxes, the retreat of the Persians, 478 B.C., left these hardy tribes free. They were still in a primitive state, mountain shepherds, ill clothed and ill housed, many of them clad only in skins. The western tribes were at this time being pushed onward into Macedonia by the migration of the Gauls. Archelaus, son of Perdiccas II., however, built forts, cut straight roads, and collected horses and arms. The cavalry of the richer landowners was good; but the foot soldiers were armed only with wicker shields and rusty swords. Archelaus also courted the friendship of leading Athenian statesmen, philosophers, and poets; and later on the Athenian general Iphicrates did essential service to the royal house.

But the advance made by Archelaus, who died 399 B.C., was almost all lost before Philip II. came to the throne, and the kingdom was reduced to a narrow district round Edessa, shut out from the sea by Greek cities. Olynthus, the chief of these cities, had in the reign of Philip's father, Amyntas II., induced many places to make themselves independent of the king, but the jealousy of Sparta proved fatal to the Olynthian confederacy, and destroyed what would have been a bulwark against the barbarians of the north (379).

Philip himself had the best of all trainings, that of adversity. During the reign of his eldest brother Alexander II., Pelopidas took hostages for the fidelity of Macedonia, and among them was Philip, then about fifteen years old. He remained two or three years at Thebes, profiting by literary training, and above all by the living example of Epaminondas, the ablest organizer and most scientific tactician of the age, who had trained the soldiers that broke through the Spartan line at Leuctra. When Philip returned home, his brother Perdiccas III. intrusted him with the government of a district, where he organized a force on the Theban model. On the death of Perdiccas, though he left an infant son, Amyntas, Philip was called to the throne (359), for the reign of a child in an early state of society means anarchy. Philip's energy soon made itself felt. He fortified a new capital, Pella, safe amid its lake-like marshes, from which he could act against the coast. Greece was at the moment completely disorganized. Sparta had lost, not only her supremacy over the other Greek states, but the control over Messenia and Arcadia, which leaned on Thebes for defense against her revenge. Thebes had incurred odium from her conduct toward the free cities of Boeotia, was at feud with Athens, and had but a precarious hold over Phocis and

Thessaly, while Thessaly itself, after the fall of the tyrants of Pheræ, was a prey to internal feuds. Athens was the first to come into collision with Philip, owing to her holding possessions on the coast of Macedonia and Thrace, whence she procured ship timber and naval stores.

The Amphictyonic League was called into activity to crush the Phocians, who in their despair seized Delphi, and by the use of its treasures collected troops enough to hold Thebes in check for some years. It was the misfortune of Greece that there had arisen mercenary bands, like the condottieri of mediæval Italy, who hired themselves out to anyone that would employ them. The citizens became more averse to service as civilization increased, and the work of war was now done by alien hands. Only a standing army could face the standing army of Macedonia, but the industrious and refined citizens naturally disliked continuous service, and it was long before even Demosthenes could arouse Athens to the necessity of the struggle. He was opposed by the old statesmen, by honest men such as Phocion (whose peace policy, however expedient after Chæronea, was impolitic during most of Philip's reign), and by others whom Philip had bribed—for he loved to "plow with a silver plowshare." The Sacred War gave Philip a pretense for interfering on behalf of the Delphic god. He drove the Phocian mercenaries from Thessaly, incorporated the excellent Thessalian cavalry in his army, and gained a good naval position on the Gulf of Pagasæ (Volo), the great inlet and outlet for the trade of the country. This also opened the way to Eubœa, for the possession of which, however, Athens struggled hard. It was on the Gulf of Pagasæ that Demetrius was afterward founded, which, with Chalcis and Corinth, became the "feters of Greece." Philip also laid a strong hand on Epirus, occupied Acarnania, won over the Ætolians by the gift of Naupactus, and thus hemmed in Athens on the land side. It is true that, when he marched on Thermopylæ, B.C. 352, a sudden effort of the Athenians enabled them to reach the pass in time to arrest his progress, and save the Phocians for awhile; but Philip had now a large seaboard, and he proceeded to increase his fleet, to extend his dominion in Thrace on both sides of the Hebrus, and secure it by the foundation of Philippopolis, Calybe, Berea, and Alexandropolis, while the Greek colonies along the Euxine up to Odessus sought his alliance. There was worse to come, for Philip by the year 347 had destroyed Olynthus and thirty-one other free cities in Chalcidice, and sold their inhabitants as slaves, a calamity such as had not happened since the invasion of Xerxes. This struck terror into all the south country, and we find Isocrates, once the champion of Panhellenic freedom, proclaiming Philip the arbiter of Greece, and advising him to use his power for the purpose of conquering Persia. He found himself bitterly deceived, and "that dishonest victory at Chæronea, fatal to liberty, killed with report that old man eloquent." The Thebans were still unwilling to combine with Athens, and even called in Philip to end the Sacred War. This gave him the command of Thermopylæ and the means of marching into Boeotia and Attica, while the destruction of the Phocians spread the terror still more widely. Philip now became the recognized religious leader of the Amphictyonic League, and began to interfere authoritatively in the Peloponnese. He was also preparing to master the Bosphorus and the Hellespont, the outlets from the Euxine into the Ægean, through which the main supplies of corn came from the country north of the Euxine to Athens, which therefore laid great stress on the possession of the Chersonese. Once again Athens gained a success when she sent Phocion to relieve

Byzantium from his attack (339). The Greek cities began again to lean on her, and her trade increased owing to the destruction of Olynthus by Philip, and of Sidon by the Persian king Ochus. The Greeks, too, began to see that Philip's allies were being swallowed up one by one. Philip himself, when returning through the passes of Hæmus from an attack on the Scythian king, who ruled between the mountains and the Danube, suffered heavily from a surprise by the Triballi. But a second Sacred War against the Locrians of Amphissa, caused by Æschines' troublesome activity, again brought Philip into the heart of Greece. He fortified Elatea in Phocis, and demanded a passage through Bœotia to attack Athens. On this Demosthenes won his greatest triumph, when he induced Thebes to join in the struggle for freedom and independence; and though the patriots were defeated at Chæronea, 338 B.C., yet their blood was not shed in vain; their example has told on all future time. Philip used his victory moderately, for he wished to leave Greece quiet behind him when he crossed into Asia to assail the great king. He garrisoned the citadel of Thebes, and demanded from Athens an acknowledgment of his leadership in the national war against Darius; and a congress at Corinth recognized him as its chief, and arranged what contingents were to be sent from each state. His assassination in 339, at the early age of forty-seven, hardly delayed the execution of the plan, for he was succeeded by Alexander, who combined the qualities of a king of the heroic ages with all that Greek training could give. Though the Macedonians had a dialect of their own, yet they had neither language for communicating with others nor any literature except what they derived from Greeks, and Philip had taken care to give his son even a better training than he had received himself. Alexander was also as prompt and cruel as his father. He at once rid himself of his cousin and brother-in-law Amyntas and other kinsmen and possible competitors for the throne, or persons otherwise dangerous. Then he dealt some heavy blows against the barbarians east, north, and west, some of whose chiefs he took for further security with him into Asia. He was just south of Lake Lychnitis, on the western side of the range of Scardus or Pindus, when the news reached him that the exiles had roused Thebes to arms, and were besieging his garrison in the Cadmeia or citadel. Striking through a cleft in the main range of mountains, through which the Devol flows, and marching south along the Haliacmon and over the Cambunian ridge, which joins Pindus to Olympus, he reached Bœotia in less than a fortnight, stormed Thebes, sold the citizens as slaves, and destroyed the place. The citadel alone remained as a Macedonian fortress, until Cassander rebuilt the city. Amid the general terror, Alexander thought it wisest to follow his father's policy here also, and be content with his election as captain-general by the congress of Corinth.

He left Antipater as regent, and at once crossed the Hellespont to Sestus in the spring of 334, before the Persian fleet was ready to intercept him, or the main Persian army had been embodied. Philip had formed the local battalions of militia into the phalanx, arrayed sixteen deep, and armed with long two-handed pikes (*sarisse*); and this steady body of pikemen, with the veterans in the front ranks, had borne down on the open plain of Chæronea the resistance of the Greek hoplites, who were only armed with a much shorter spear. The phalanx was supported on the flanks by the light infantry of the guard, by targeteers trained after the plan of Iphicrates, by light lancers, and by a strong body of heavy cavalry, headed by the king's companions, and fighting with the short thrusting pike. It was the

charge of the cavalry led by Alexander in person, at the head of the "agema" or royal squadron, that decided all his battles. It seems strange, however, to us to hear that the men had neither saddles nor stirrups, nor were the horses shod. The fine native army was largely reinforced by barbarian archers, darters, and slingers, and by regiments of Greek mercenaries; and this systematic combination of different arms and kinds of troops was supported by field and siege artillery of an improved type. Later on, when the main Persian army was broken up, Alexander added to the number of light troops, and made the regiments smaller and more flexible. Philip had molded his country into a military monarchy, and turned the nobles into a caste of officers. All its strength was devoted to the one object of war, and it became for the time an overmatch for all its neighbors. On the other hand, Persia had deprived the subject peoples of national life and spirit; the retreat of the Ten Thousand had shown how useless her native levies were, and now her defense rested almost entirely on a force of Greek troops under the able Rhodian general Memnon. The Orientals fought mainly with missiles, and were little suited for close combat hand to hand. The Persian satraps, however, had around them some choice horsemen, armed with missile javelins and with scimitars; and they insisted, against Memnon's advice, on fighting at the Granicus, which flows northward from Ida into the Propontis, but is everywhere fordable. A sharp cavalry action at the passage of the river (334 B.C.) gave Alexander all Asia Minor, and the completeness of his victory might seem to justify Livy's saying that he "did but dare to despise an empty show," and the words attributed to his uncle, Alexander of Epirus, that he himself had found the men's chamber in Italy, while his nephew had found the women's in Asia. The Greeks had long been conscious of their superiority.

Agasilaus of Sparta and Jason of Phæræ had already planned the attack on Persia, and the liberation of the Asiatic Greeks; and Alexander acted in the full consciousness that he was extending Greek rule and civilization over the East. At the news of the battle on the Granicus, Sardis surrendered. It was the center to which all the routes converged, but Alexander did not (like Cyrus the younger) at once push on into the heart of the empire along the great road that led from Sardis to Susa. His object was to secure a firm base of operations, by occupying the line of coast round the Ægean, and forcing the Phœnician fleet in the Persian service to retire. The Greek colonization of Asia Minor had prepared the way for him; the Greek cities along the western and southern coast threw open their gates, and Alexander restored their popular constitutions. He even recognized the Lycian confederation. Memnon was only able to organize a resistance at Miletus and Halicarnassus. But his real plan was to put troops on board his ships and raise Greece against the Macedonian yoke, especially as the Athenian fleet was still more than a match for that of Alexander. But when Memnon died there was no one left to carry out this able plan, and Darius threw away his best chance by recalling the troops. Then Alexander marched up northward from Lycia through Pisidia and Phrygia to Gordion on the Sangarius, whence the main road led east across the Halys and through Cappadocia to Cilicia, between the passes of Mount Taurus and those of Mount Amanus. Here Darius tried to throw his army across the Greek line of communication with their supplies, but his host, crowded together in the narrow ground on the river Pinarus near Issus, was hopelessly defeated. The modern name of the Gulf of Issus, "Iskenderun," still preserves the memory of Alexander. Then Parmenio,

Alexander's second in command, pushed on and took Darius' treasures and stores at Damascus. Again, however, Alexander deferred his march inland till he had mastered Phœnicia and Egypt, and so gained the command of the sea in the eastern basin of the Mediterranean. Only the brave freemen of two fortified cities, Tyre and Gaza, held out; and when the Phœnician and Cyprian fleet transferred its allegiance to the invader their only effective weapon was wrested from the hands of the Persians. The occupation of Cyprus and Egypt had been one of the boldest conceptions of the age of Pericles and Cimon, and its success would have secured the supremacy of Greek commerce. As the Persians had persecuted the Egyptians for their worship of animals, Egypt welcomed the deliverer, and recognized him as the son of Ammon; while the Greek colonies of Cyrene and its Pentapolis sent to tender submission. Alexandria was founded on the seaboard as a new center of commerce, from which it was easy to communicate with the government and with all parts of the empire. The protecting island of Pharos gave the means of forming two good harbors on a coast elsewhere harborless; while Lake Mareotis, communicating by canals with the Nile, enabled produce to be easily brought down from the interior.

At last the time was come for delivering the final blow to Persia. Alexander passed the Euphrates at Thapsacus ("the passage"), and then marched northeast through the hilly country by Nisibis, to avoid the hot desert of Mesopotamia. He crossed the Tigris unopposed, and defeated Darius' hosts at Gaugamela. The long struggle of 200 years between Greece and Persia was at an end. The victory converted Alexander into the great king, and Darius into a fugitive pretender; and Babylon and Susa submitted. At Babylon Alexander sacrificed to the native gods, as he had done elsewhere, and this admixture of the religions of all countries largely influenced the later phases of heathenism. In administering these countries, Alexander separated the civil, military, and financial functions, and, where natives were left in office, intrusted taxation and military command to Macedonians. The great power of the satraps had weakened the central government of Persia, and Alexander adopted a wiser plan, but his generals restored the old system after his death. The Persian treasures, dispersed by the conquest, gave a fresh stimulus to commerce, especially as Persia was rich in gold, which was scarce in the West. Alexander had already prepared the way for a universal currency by coining silver didrachms and tetradrachms after the Attic standard, which became current coinage over most of the East; the Ptolemies, however, adopted the Phœnician standard for Egypt. Up to this point the countries conquered admitted of being more or less assimilated and Hellenized; but, when Alexander penetrated through the passes that led up to Persepolis in Persia, and thence to Ecbatana in Media, and again north to secure the defiles that led down to the Caspian, and so skirting the southern flank of the range of Elburz to Hecatompylus in Parthia, the center of the roads leading to Hyrcania (at the southeast of the Caspian), to Bactria, and to Ariana, and then from Kandahar northward to Cabul, and through the mighty range of the Hindu-Kush to Bactria (Balkh) south of the Oxus, and Sogdiana (Bokhara) between that river and the Jaxartes, and at last as far as the Indus and the Punjab, his route lay through tribes that still possessed their native strength and power of resistance to foreign influence, though for the moment overborne by the superiority of the Western arms. Alexander saw the danger, and met it by settling Greek colonists in new cities which were to serve as military posts, depots

of commerce, and centers from which to Hellenize the country districts; and many of them are still important points in the East, though the desert has spread, and robber hordes have stopped some of the old caravan routes. Such places are Merv, Herat, Kandahar, Cabul, Samarkand, Khojend. Bactria and Sogdiana were to serve as a frontier against the wild hordes of the north, and thus Alexander's measures determined the fortune of Transoxiana for centuries. Some native rulers also were left to form a sort of barrier in front of the empire to the north and east. Alexander laid the main stress on securing the great rivers, the Euphrates and the Tigris, the Oxus and Jaxartes, the Indus and Hydaspes. In Greece itself the Macedonian kings upheld tyrants or oligarchies, but here freer municipal constitutions were allowed to attract colonists. Alexander further planned to fuse the noble Persian race with the Greeks by intermarriage, and by giving the Persians equal rights in the army and the administration. Common service in these was the best means for Hellenizing the natives.

The Eastern nations responded to the touch, and Persian legend to this day preserves the name of Iskander among the names of their national heroes. Alexander's conquests were to be justified by the result, by the union of East and West, and the diffusion of Western civilization over Asia. Even India should feel something of the new influence. Alexander would have made the nations into one. But if the East was becoming Hellenized, yet Alexander became in turn Orientalized. Could he remain a Western king and also an Oriental despot? a Greek and a Persian? It might be good policy, but Philip's old generals could not help showing their disgust, and Clitus and others paid for it with their lives. The Greek states also felt the difference. Just before his death Alexander required them to worship him as a god, and, without any regard to the rules agreed on at the congress of Corinth, forbade the federal meetings of the Achæans and Arcadians, and issued a decree restoring all exiles to the various states. Greece became practically a province of the Eastern empire, and the patriots who had maintained the fight for freedom were more than justified by the ruin that came on Greece through Alexander's successors. Even if he himself had not been spoilt by success and absolute power, yet he was but a lucky accident. And, though the Hellenizing influence spread over much of the East in a way to which there has been but, one parallel, the mixture of German and Roman elements when the barbarians invaded the empire, yet Alexander's conquests, while they Hellenized Asia, tended to Asiaticize Hellas; they put an end to the genuine Hellenic spirit, to its productive genius and consummate literary and artistic excellence, as well as to its political freedom.

Last of all, Alexander marched along the Cabul river, and through the pass of Jellalabad to the passage of Indus by Attock; but when he reached the Hyphasis (Sutlej) the weary troops refused to cross it and press on to the Ganges. He then sent Nearchus down to Indus, to sail round to the mouth of the Euphrates, and explore a route for traffic across the Indian Ocean. Nearchus profited by the monsoons, which thus became known to the Greek sailors. The king himself went down the river to see the great southern ocean with its strange tides, and he planned that an Alexandria on the Indus should communicate with the Alexandria of the Nile valley by an intermediate harbor on the Euphrates. He further planned the circumnavigation of Arabia, if not of Africa also, and a voyage to the north of the Caspian. At the same time Pytheas of Marseilles was exploring the British and Baltic seas. This enlarged and systematic exploration of the earth. com-

bined with increased means of communication among its inhabitants, was beneficial to civilization, if we may define growth in civilization as growth in the amount of services rendered to each other in civil society. The record kept by Alexander's quartermasters of the length of his marches gave succeeding geographers important information; and it was more useful to Eratosthenes than the vague descriptions in the historians, who were striving after literary effect, and some of whose accounts were very legendary, for legends soon clustered round the name of the great conqueror. Alexander seems also to have had a description of the empire drawn out. After his return through the desert of Baluchistan, along the Indian Ocean, he devoted himself to consolidating the internal administration and checking the oppression exercised by his officers; but he was planning new conquests in the West, from all parts of which he had received ambassadors, when he died of marsh fever at Babylon (323 B.C.), at the early age of thirty-two.

All attempts to keep his empire together inevitably failed, but his work was done, since, whether for good or evil, the Hellenizing of the East determined the whole course of history. The army resolved that his child (not yet born) by his Bactrian wife Roxane, and his imbecile half-brother, Philip Aridaeus, should bear rule jointly. First Perdiccas was named regent, but the generals began to combine against him, and he perished in trying to reduce to obedience Ptolemy, the satrap of Egypt, the man who saw most clearly and earliest the tendency of events. Then Antipater, who had with difficulty defeated the gallant attempt of the Greeks under the leadership of Athens to regain their freedom in the Lamian War, was made regent. On his death-bed he transferred the office to Polysperchon, who soon proved unequal to his task, and even gave up Phocion, the leader of the Macedonian party at Athens, to death. Antigonos, the commander-in-chief in Asia, destroyed Eumenes, who was faithful to the royal house, but was a Greek from Cardia and not a Macedonian. He then tried to reunite the satrapies; but Ptolemy of Egypt, Lysimachus of Thrace, and Seleucus of Babylon combined with Cassander of Macedon against him, and he fell (301 B.C.) at the battle of Ipsus in Phrygia. This decided the final break-up of the empire.

MACEDONIUS, a deacon, was raised to the patriarchate of Constantinople as successor of Eusebius of Nicomedia by the Arian bishops in 341 A.D., while the orthodox party elected Paul, whom Eusebius had superseded.

MACEOIO, or **MACAYO**, a city of Brazil, the chief town of the province of Alagoas, and one of the ports open to foreign trade, is situated about 150 miles south of Pernambuco, on an eminence about a mile from the shore. Population, 20,000.

MACERATA, a city of Italy, the chief town of a province, a bishop's see, and the seat of a court of appeal, lies twenty-two miles south of Ancona, and seventeen miles by road west of Civita Nova. Population, (1901), 22,806.

MACGILLIVRAY, **WILLIAM**, a Scotch writer on several branches of natural science, but best known as an ornithologist, was born in 1796, and died in 1856.

MACHIAVELLI, **NICCOLÒ**, was born at Florence on May 3, 1469. His ancestry claimed blood relationship with the lords of Montespetoli, a fief situated between Val di Pesa and Val d'Elsa, at no great distance from the city. Niccolò's father, Bernardo, who was born in 1428, followed the profession of a jurist. Of Niccolò's early years and education little is known. He is said to have studied under the grammarian Marcello Vir-

gilio Adriani; and his works show wide reading in the Latin and Italian classics. But it is almost certain that he had not mastered the Greek language. Died in 1527.

The year 1494, the year of Charles VIII.'s invasion and of the Medici's expulsion from Florence, saw Machiavelli's first entrance into public life. He was appointed clerk in the second chancery of the commune under his old master Marcello Virgilio Adriani. Early in 1498 Adriani became cancellor of the republic, and Machiavelli received his vacated office with the rank of second cancellor and secretary. This post he retained till the year 1512. In 1500 Machiavelli traveled into France to deal with Louis XII. about the affairs of Pisa. It is enough to say in general that these embassies were the school in which Machiavelli formed his political opinions, and gathered views regarding the state of Europe and the relative strength of nations.

His office obliged him from time to time to draw up proposals and memorials on questions of the day, which he presented to the Dieci. One of these, on the affairs of Pisa, belongs to 1499; a second, on the condition of Pistoia, to 1501; a third, of more general importance, on the right way of dealing with the rebels of Val di Chiana, to 1502. In this last-named document some of the points of view which stamp his later works with a distinctive character emerge into prominence. We find him seeking parallels and precepts in Roman history, laying down the axiom that human nature is identical throughout the ages, exposing the futility of half measures, and finally appealing to Cesare Borgia as a model of political sagacity. It is clear from this brief and early composition that Machiavelli had already formed the habits of thought which distinguished him. He has begun to idealize Borgia's policy.

The year 1502 was marked by yet another decisive incident in Machiavelli's life. In October he was sent, much against his will, as envoy to the camp of Cesare Borgia, or duke of Valentino, as he was now called. The duke was then in Romagna, and it was Machiavelli's duty to wait upon and watch him. He was able now to observe those intricate intrigues which culminated in Cesare's seizure of Sinigaglia and the treacherous murder of his disaffected captains. From what remains of Machiavelli's letters to the Dieci during this period, and from his tract upon the *Modo tenuto dal Duca Valentino nell' ammazzare Vitellozzo Vitelli*, we are able to appreciate the actual relations which existed between the two men, and the growth in Machiavelli's mind of a political ideal based upon his study of the duke's character.

On his return to Florence early in January, 1503, Machiavelli began to occupy himself with a project he had long since formed, and which his recent attendance upon Cesare Borgia had strengthened in his mind. The duties of his office obliged him to study the conditions of military service as they then existed in Italy. He was familiar with the disadvantages under which republics labored when they engaged professional captains of adventure and levied mercenary troops. The bad faith of the condottiere Paolo Vitelli (beheaded at Florence in 1499) had deeply impressed him. Early in 1503, Machiavelli drew up for Soderini a speech, *Discorso sulla provizione del Danaro*, in which the duty and necessity of liberal expenditure for the protection of the state were expounded upon principles of sound political philosophy. Between this date and the last month of 1506, Machiavelli labored at his favorite scheme, working out memorials on the subject for his office, and suggesting the outlines of a new military organization. On December 6, 1506, his plan was approved by the signory, and a special ministry, called the *Nove di Ordinanza e Milizia*, was appointed. Machi-

avelli immediately became their secretary. The country districts of the Florentine dominion were now divided into departments, and levies of foot soldiers were made in order to secure a standing militia. A commander-in-chief had to be chosen for the new troops. Italian jealousy shrank from conferring this important office on a Florentine, lest one member of the state should acquire a power dangerous to the whole. The choice of Soderini and Machiavelli fell, at this juncture, upon an extremely ineligible person, none other than Don Michele, Cesare Borgia's cut-throat and assassin.

Meanwhile Italy had been the scene of memorable events, in most of which Machiavelli took some part. Alexander VI. had died suddenly of fever. Julius II. had ascended the papal chair. The duke Valentino had been checked in mid-career of conquest. Machiavelli was sent to Rome during the conclave, when he renewed his intercourse with Cesare Borgia. On this occasion he seems to have felt nothing but contempt for the hero of his dreams, who had sunk into insignificance and almost abject submission. The collapse of the Borgias threw central Italy into confusion; and Machiavelli had, in 1505, to visit the Baglioni at Perugia and the Petrucci at Siena. In the following year he accompanied Julius upon his march through Perugia into the province of Emilia, where the fiery pope subdued in person the rebellious cities of the church. Upon these embassies Machiavelli represented the Florentine Dieci in quality of envoy.

The greater part of 1506 and 1507 was spent in organizing the new militia, corresponding on the subject, and scouring the country on enlistment service.

Machiavelli returned from Germany in June, 1508. The rest of that year and a large part of 1509 were spent in the affairs of the militia and the war of Pisa. Chiefly through his exertions the war was terminated by the surrender of Pisa in June, 1509. Meanwhile the league of Cambray had disturbed the peace of Italy, and Florence found herself in a perilous position between Spain and France. Soderini's government grew weaker. The Medicean party lifted up its head. To the league of Cambray succeeded the Lega Santa. The battle of Ravenna was fought, and the French retired from Italy. The Florentines had been spectators rather than actors in these great events. But they were now destined to feel the full effects of them. The cardinal Giovanni de' Medici, who was present at the battle of Ravenna, brought a Spanish army into Tuscany. Prato was sacked in August, 1512. Florence, in extreme terror, deposed the gonfalonier, and opened her gates to the princes of the house of Medici.

The government on which Machiavelli depended had fallen, never to rise again. The national militia in which he placed unbounded confidence had proved inefficient to protect Florence in the hour of need. He was surrounded by political and personal enemies, who regarded him with jealousy as the ex-gonfalonier's right-hand man. Yet at first it appears that he still hoped to retain his office. He showed no repugnance to a change of masters, and began to make overtures to the Medici. The Nove della Milizia were, however, dissolved; and on November 7, 1512, Machiavelli was deprived of his appointments. He was exiled from Florence and confined to the dominion for one year, and on November 17th was further prohibited from setting foot in the Palazzo Pubblico. Ruin stared him in the face; and, to make matters worse, he was implicated in the conspiracy of Pier Paolo Boscoli in February, 1513. Machiavelli had taken no share in that feeble attempt against the Medici, but his name was found upon a memorandum dropped by Boscoli. This was enough to insure his imprison-

ment. He was racked, and only released upon Giovanni de' Medici's election to the papacy in March, 1513. When he left his dungeon, he retired to a farm near San Casciano, and faced the fact that his political career was at an end.

Machiavelli now entered upon a period of life to which we owe the great works that have rendered his name immortal. In retirement at his villa near Percussina, a hamlet of San Casciano, Machiavelli completed the *Principe* before the end of 1513. This famous book is an analysis of the methods whereby an ambitious man may rise to sovereign power. It appears to have grown out of another scarcely less celebrated work, upon which Machiavelli had been engaged before he took the *Principe* in hand, and which he did not finish until some time afterward. The second treatise is the *Discorsi sul primo libro delle Deche di Tito Livio*.

After finishing the *Principe*, Machiavelli thought of dedicating it to one of the Medicean princes, with the avowed hope that he might thereby regain their favor and find public employment. To Lorenzo the *Principe* was dedicated, but without result. The Medici, as yet at all events, could not employ Machiavelli, and had not in themselves the stuff to found Italian kingdoms.

In the spring of 1526 Machiavelli was employed by Clement VII. to inspect the fortifications of Florence. He presented a report upon the subject, and in the summer of the same year received orders to attend Francesco Guicciardini, the pope's commissary of war in Lombardy. Guicciardini sent him in August to Cremona, to transact business with the Venetian provveditori. Later in the autumn we find him once more with Guicciardini at Bologna. Thus the two great Italian historians of the sixteenth century, who had been friends for several years, were brought into relations of close intimacy.

After another visit to Guicciardini in the spring of 1527, Machiavelli was sent by him to Civita Vecchia. It seemed that he was destined to be associated in the papal service with Clement's viceroy, and that a new period of diplomatic employment was opening for him. But soon after his return to Florence he fell ill. His son Piero said that he took medicine on June 20th which disagreed with him; and on the 22d he died, having received the last offices of the church.

MACHINE TOOLS. The very small degree of antiquity to which machine tools can lay claim appears forcibly in the sparse records of the state of the mechanical crafts a century ago. A few tools of a rude kind, such as tilt-hammers, and a few special ones which aimed at accuracy, but were of very limited application, such as "mills" for boring cannon, or "engines" for cutting the teeth of clock wheels, were almost their only representatives. Machine tools of the modern type indeed would not then have been likely to have found much favor even if they had been invented, owing to the difficulty of providing sufficient power for driving them, except in the comparatively few positions where water-power was available. The transmission of power was unthought of, except for the very limited distances which were possible with the ill-fitted "gudgeons" and "lanterns and trundles" of the old millwrights.

The steam-engine, however, changed all this. On the one hand the hitherto unheard-of accuracy of fit required by its working parts created a demand for tools of increased power and precision, and on the other it rendered the use of such tools possible in almost any situation. Thus, acting and reacting on each other, machine tools and steam-engines have grown side by side, till our workshops have become peopled with a race of giants, capable of uncomplainingly performing tasks altogether beyond the powers of the easily wearied

hands which have brought them into existence. But the first steps in the process were costly and difficult to a degree which it is not now easy to realize. James Watt, for instance, in 1769, was fain to be content with a cylinder for his "fire-engine" of which, though it was but eighteen inches in the bore, the diameter in one place exceeded that at another by about $\frac{3}{8}$ (.375) of an inch; its piston was not unnaturally leaky, though he packed it with "paper, cork, putty, pasteboard, and old hat." In the bore of a cylinder of 120 inches there would not now be admitted an error of $\frac{1}{100}$ of an inch, and the leakage past the piston is practically *nil*. Even this must by no means be taken to represent the extreme limit attainable in respect of size and accuracy.

"The *Steam Hammer*, which in some respects may be regarded as the most important of machine tools, has already been noticed (see HAMMER). Second only to it in importance, and long anterior to it in date, stands the *lathe*. At what exact point of its development from the simple foot lathe it first became entitled to rank as a machine tool we will not stop to inquire, for the origin of this, as of most of the mechanical legacies which have been handed down to us by successive inventors and improvers, is involved in much obscurity. But as far as tools laying any claim to precision are concerned it appears certainly to have been the first to come into existence.

Screw cutting in the lathe was another problem—and a more worthy one—which occupied the attention of inventors at the same early period (1680).

Nearly two centuries seem to have elapsed before what we now know as the *slide-rest* became a recognized adjunct to the turning lathe, though in the meantime arrangements have been devised for controlling the motion of the tool by attaching it to some portion of the mechanism in some special cases—as in that of two curious lathes for turning hyperbolic, spherical, or plane mirrors for optical purposes.

In the self-acting *screw-cutting lathe* with double-gear headstock, a type now well established, the arrangements for obtaining and varying this traversing motion may be observed. A steel *leading screw* runs along the front of the lathe bed, and with it the slide-rest can be connected at pleasure. Two or more *change wheels*, properly proportioned as to the number of their teeth, connect the head of the screw with the hinder end of the mandrel.

Although a leading screw is not the only nor in all cases the best mode of rendering a lathe self-acting, ordinary screw-cutting lathes are very largely used for other purposes than that implied by their name. The advantage of perfect regularity in the feed is very great even for plain turning, and this can only be secured when it is independent of human vigilance. The feed in a direction transverse to the bed is also very commonly rendered automatic. In this case, however, the varying diameter of the successive cuts introduces serious objections to a uniform rate of feed.

To enable a comparatively small lathe to be used for surfacing work of larger diameter than it would naturally admit, a portion of the bed is frequently made removable so as to leave a "gap" close to the fixed headstock.

Break lathes carry the same principle still farther, so that they can take in work of considerable length as well as of large diameter—the treble-gear headstock and all other parts being in their case made of sufficient strength to bear the heavy strains which result from the increased size and weight of the work, a quality in which gap lathes are not infrequently deficient.

Face lathes, of which the main duty is surfacing articles whereof the diameter is great but the length

small, are very similar to the foregoing, minus the entire right-hand portion of the bed and all that it carries. They have occasionally been made for work of very large diameter—such as turning the roller paths of forty-foot railway turn-tables—though it is now found preferable to turn such things in a horizontal position, in lathes of which the mandrels are vertical.

But the point to which the growth of power-lathes has now attained will be best illustrated by the following interesting particulars of two which have been designed and made in the Royal Gun Factories at Woolwich. Each of these can take in a piece of work having a maximum diameter of twelve feet and a total length of thirty-six feet—which represents a truly appalling weight of metal to have to deal with.

In lathes of this enormous size—as in all machine tools of the heaviest class—great weight and a proper disposal of it on a thoroughly secure foundation are necessary for obtaining the rigidity which is a first essential to success. When, however, this and all other conditions have been fulfilled, and the tool and the speed have been suitably adjusted, the operation of paring off great shavings from the revolving mass becomes one of such apparent facility that it is almost difficult for a stranger to believe that it is not lead or some yet softer substance, rather than wrought iron or steel, which is under treatment.

It has been found that in heavy turning the best results are obtained by taking deep cuts at a low rate of speed, fast driving bringing no corresponding increase in the amount of work got through. Various other means have therefore been devised for accelerating operations. Each of the Woolwich lathes just mentioned is furnished with two slide-rests, so that two independent cuts can be taken at once at different parts of the work. The *duplex system* effects the same thing in a different way, two slide-rests (one in front and the other at the back of the lathe) being mounted on one saddle and adjusted simultaneously by a single right and left handed screw—a plan which has the advantage of subjecting the work to two opposite strains which either wholly or partially balance each other. In some instances both the above advantages are combined by using two duplex rests at different parts of the bed. A *quick hand traverse* is another time-saving arrangement, now common to almost all screw-cutting lathes. It enables the slide-rest to be run quickly back from the end of one cut to the starting point of the next. In turning up a number of similar articles upon each of which several different tools have to be used in succession, the time which would be lost in changing the tools is sometimes saved by employing a *captain rest*, in which the whole series of tools is so fixed once for all that each in turn can be brought to bear upon the work without further adjustment.

Second only to the lathe in its importance stands the *planing machine*. Just as the slide lathe renders it easy to turn a cylindrical surface true from end to end, a task which before its introduction had been one of extreme difficulty, even for the most highly skilled workman, so the planing machine supersedes, by a method giving vastly superior results, the difficult and costly process of hand chipping and filing, by which flat surfaces of metal were formerly produced. Although it is a comparatively modern invention, its real origin is obscure. No drawings or description of any planing machine at all resembling those now in use were published in England previously to those of one made by Clement in 1825, which appeared in the *Transactions of the Society of Arts*. With this beautiful machine, which was of considerable size, being capable of admitting articles measuring as much as six feet in height or

width, he obtained results which would satisfy all ordinary requirements at the present day.

The action of a planer bears no resemblance to the familiar process of wood planing, but is analogous to that by which the successive cuts of a narrow tool produce a cylindrical surface in a slide lathe. A traversing table carries the work and forces it against the tool, which is stationary while making its cut, but between the cuts has a slight "feed" motion along its horizontal slide. Perfectly parallel cuts are thus taken from every portion of the work in succession, the result being a surface, not indeed perfectly smooth and free from scores, but (what is generally far more important) possessing a general flatness and freedom from twist which can be obtained only with a great expenditure of time and trouble by hand labor. The extent to which machinery has cheapened work of this kind will be appreciated from the fact that in 1826 the cost of rendering a square foot of surface true by hand chipping and filing was \$3.00, whereas in 1856 it could be done in the planing machine at a cost of less than 2 cts.

Planing machines, equally with lathes, are required not only to give good results, but to give them quickly. Provision is therefore made for regulating the traverse of the table to suit the length of the cut, and for utilizing or accelerating its return journeys. The former is sometimes done by fixing the tool in a *revolving tool-holder* or "jim-crow," so that its face can be always turned toward its cut, and for accomplishing the latter there are various arrangements which give a "quick return" to the table. It is also a common practice to use two tools at once, as in turning. It will be observed that the size of the work which can be treated in a planing machine, is strictly limited by the clear width between the standards, and the height of the horizontal slide above the table when at its highest point. Although these dimensions are very considerable in the larger sizes, which can occasionally take in articles over nine feet in width and height and fifty feet in length, yet it is sometimes desirable to be able to exceed them, and in these large machines the weight of the table and the power consumed in driving and reversing it become a serious consideration. It is therefore mechanically preferable to keep the work at rest when it is large or heavy, and to give all the requisite movements to the tool. This view is now gradually gaining favor, and the makers of some recent machines have adopted a form of construction entirely different from the above, which has the advantage of enabling cuts either horizontal or vertical, to be taken from any piece of work which can be secured to the base-plate, so that its full size is almost immaterial.

When once properly started, the *vertical drilling machine* is self-acting, but for each hole the work has to be adjusted by hand so as to bring the required portion exactly under the drill spindle, and the small size of the table prevents its being at any great distance from the edge. These objections are remedied in larger machines, either by making the table capable of horizontal adjustment—a good way of doing this being to pivot a circular table at the end of an arm which can revolve round the main standard of the machine—or by mounting the drill spindle on a radial arm, and enabling its distance from the standard to be varied. In the first case the tool is then distinguished as a "pillar" and in the second as a "radial" drilling machine. Either of these methods enables the drill to be brought to bear exactly upon the desired spot (within certain limits as to distance from the edge, etc.), the first by adjusting the work below the drill, the second by adjusting the drill over the work. A *wall drill* dispenses with a table altogether, and gives great facilities for operating on large

pieces of work, especially if the means of adjustment is secured by the radial arm just mentioned. *Multiple drilling machines*, with which a series of holes can be drilled at once, are serviceable tools for some purposes, mainly on account of the saving of time which they effect.

Boring machines deal chiefly with apertures of large diameter, for which great straightness and accuracy are required, such as the cylinders of pumps, steam-engines, etc., or the bores of guns. The latter object brought them very early into existence, as already mentioned, and the general principle upon which the rude machinery of more than a century ago bored out the old cast iron mortars is still used for the powerful weapons of our own day. It consists in the employment of a *boring bar* formed by mounting a series of cutters (or a combination of guides and cutters) round the periphery of a cylindrical "head" somewhat less in diameter than the required bore. The head may be either a fixture at the end of its bar, in which case it forms a kind of drill with several cutting edges, or it may be so arranged as to traverse the bar to a small extent at each revolution—a plan which is generally preferred for all open-ended cylinders, etc., and which admits of the work being kept stationary throughout the operation. The bar when in use is mounted either vertically or horizontally, according to circumstances, in a lathe or boring machine. The excellent results obtainable in this manner will be appreciated from the fact that with the gun-boring machinery at Woolwich a hole ten inches in diameter and ten feet deep can be bored in solid steel at a single operation, and holes have been carried to a depth of twenty-four feet with a variation of less than $\frac{1}{100}$ of an inch in the diameter. The accuracy of modern machine work indeed not infrequently brings into prominence sources of error which were previously unsuspected. The boring of large cast iron cylinders affords an instance of this, for it has been found that, however true the boring tool may be, the distortion of the cylinder itself, through being laid on its side, is sufficient to mar the results obtained with it; consequently it has been found necessary always to bore a large cylinder in the vertical position which it will occupy when in use.

In the construction of modern machinery, etc., it is often necessary to depart from the simple geometric forms to the production of which the tools which have thus far occupied our attention are mainly adapted. We will now glance at some of the labor-saving contrivances applicable to other cases.

The *slot-drilling machine* effects (by a method said to have been first used about the year 1848) the conversion of the circular cavity producible with an ordinary drilling machine into an elongated "slot" or slit. The extent of the elongation can be varied by increasing or diminishing the reciprocating movement of the slide which carries the rotating drill.

The *slotting machine* also cuts grooves and slots, but in an entirely different manner. Those who are acquainted with the wood mortising machine, from which the idea of this tool was derived by Roberts of Manchester, will at once understand its principle and will appreciate the good service which can be rendered by this powerful paring tool. A large proportion of the shaping, etc., required in heavy work is now done in these machines, which are sometimes of great size and power. The table on which the work is placed is pivoted and mounted on a compound slide and a self-acting horizontal transverse or circular movement can thus be given to it.

For work of moderate size *shaping machines*, which are of more recent introduction than either slotting or planing machines, both of which they resemble in their

action, are in some respects more convenient. The slide which carries the tool is in their case horizontal, and its short but variable strokes are in a direction transverse to the bed, along which it can travel, just as a slide-rest travels along a lathe bed. Curved surfaces, either convex or concave, as well as flat ones, can generally be worked up automatically in these machines, but their details and arrangements vary considerably. For operating upon small surfaces, especially those of complicated outline, the plan of employing a revolving cutter, resembling a circular file, is now gaining favor. It is interesting to note that this is but a return to a system which is stated to have been devised by Doctor Hooke in 1664, and which was certainly used in some of the early "engines" for cutting the teeth of wheels. Others are of a plain cylindrical form, or are varied in outline to any extent to suit the particular purpose for which they are intended, among which purposes may be mentioned that of cutting the teeth of other milling tools. When mounted on a compound slide and used in a *milling machine*, a tool of this kind is a labor-saving contrivance of a very efficient kind, and it should be observed that it may in some cases be employed for finishing metal surfaces possessing a double curvature, to which none of the foregoing planing or shaping machines could be applied.

Profiling or edge-milling machines are a still more recent application of the milling-tool system. They enable the curved or complicated outline of a previously prepared templet to be reproduced with certainty any number of times in succession. They are in fact copying machines, acting in a similar manner to Jordan's carving machine or Blanchard's copying lathe, in both of which the form of the copy is derived from the original pattern by causing this pattern to control the movements of the revolving tool.

Another class of machine tools, which has sprung up of late years and is rapidly extending, is that of *emery grinders*. One thing which has given much impetus to these is the now not infrequent necessity for turning or shaping steel in a more or less hard condition, for doing which these and natural grinding-stones are the only substances practically available on a large scale, while the rapid wear of the latter unfits them for many of the purposes to which the artificial preparations of emery can be applied with great advantage. Accordingly *emery wheels* are now mounted for use in a great many different ways—either on slide-rests as turning tools, in *emery planers* and *emery shaping machines*, and various others in which they take the place of steel cutters, or as *tool grinders* either general or special, in which the rival material, so far from supplanting steel, does much toward increasing its efficiency, by enabling the process of grinding to be applied to many cutting tools which could previously be sharpened only with much greater labor and cost by other methods. Saws, grooved rimers and screw taps, and twist drills are familiar instances of this application. A high rate of speed is essential for obtaining the full effect of an emery wheel, half a mile a minute being by no means an unusual or excessive rate of travel for its cutting surface. A considerable amount of heat is consequently developed at the point of contact with the work, and the composition of the wheel must be such that it can endure this without injury. Some which could not fulfill this requirement have long been used by native workmen in India, but others which could fulfill it were patented in England in 1842, though for years after this they were but little known or used.

Punching and shearing machinery holds the same isolated position among machine tools that punches and shears occupy among cutting tools used by hand—if

indeed either the one or the other can be regarded as cutting tools at all. Yet, for performing rapidly and in many cases without any waste of material, shears can often claim superiority to any other means available for accomplishing the same ends. The apparent ease with which machines of this kind, acting with a slow quiet stroke, shear or perforate plates of iron, even when of considerable thickness, gives an altogether false impression of the amount of power which the operation requires. Arrangements for obviating the difficulty of placing the work exactly in the correct position for each one of a series of holes to be punched in it were devised by Maudslay; his plan, which is the one now usually adopted, being to place a traversing table in front of the machine, from some part of which it is moved to a distance depending on the "pitch" of the holes after each stroke of the punch. Another system, by which the holes could be arranged in any required pattern, was subsequently invented by Roberts.

The above examples of workshop tools have been confined to those to which the requisite power is transmitted from an independent steam-engine or some other prime mover—the usual mode of transmission being by lines of *shafting* carrying *pulleys* or *drums*. Belts pass from these to similar pulleys, which may be observed on many of the machines in use at present. But this is not the invariable method. The prime mover may itself form part of the machine, as it does in the case of a steam-hammer. Or steam may be dispensed with and water confined under a high pressure substituted—which constitutes the *hydraulic system* of distribution, now largely applied to the working of cranes and many other purposes, and to some extent also to machine tools. Punches and shears lend themselves readily to this system on account of their slow movements; so, too, do *riveting machines*. The distribution of power by hydraulic means, and also by compressed air, was patented by Mr. Bramah in 1796. Another formidable rival to steam also has now sprung up in the shape of *electricity*, and the results from it which are promised to us—and which indeed seem likely to be obtained—will go far toward revolutionizing all our present ideas as to the difficulty of transmitting power to a distance, and will work a complete transformation in the aspect of the machine tools of the future.

One other class of machines must be mentioned before concluding, viz., *measuring machines*. The greatly increased accuracy of modern work has rendered necessary the recording of very minute dimensions, such as are quite beyond the measuring powers of ordinary rules and calipers. Difference engines, i.e., machines which can measure minute differences between two articles—such as a standard gauge and an intended copy of it—have thus found a place in engineers' works.

McKEESPORT, a flourishing manufacturing borough of Pennsylvania, is situated on the east bank of the Monongahela river, at the mouth of the Youghiogheny, fifteen miles southeast of Pittsburg. It is the center of a great coal-mining district and during the decade 1890-1900 increased its population from 20,741 to 34,227. It contains national and other banks; has first-class facilities for shipping coal by railroad and river.

MACKENZIE, SIR ALEXANDER, a Canadian explorer, was a native of Inverness, born in 1755. Having emigrated at an early age to Canada, he was for a number of years engaged in the fur trade at Fort Chipewyan, on the north side of the Lake of the Hills, and it was there that his schemes of travel were formed. His first journey (July 3 to September 27, 1789)—for which he had prepared himself by a year's study in England of astronomy and navigation—was from Fort

Chipewyan along the Great Slave Lake and down the river which now bears his name to the Frozen Ocean; and his second (October, 1792, to July, 1793) from Fort Chipewyan up the Peace river across to the Columbia river, and thence westward to the coast of the Pacific at Cape Menzies, opposite Queen Charlotte Islands. The narrative of these expeditions (*Voyages through North America to the Frozen and Pacific Oceans*, London, 1801) is of considerable interest from the information it contains about the native tribes; and it is prefaced by an historical dissertation on the Canadian fur trade. Mackenzie was rewarded for his discoveries by the honor of knighthood in 1801. He died in 1820.

MACKENZIE, SIR GEORGE, of Rosehaugh, knight, a prominent Scottish lawyer, was born at Dundee in 1636 and died in 1691. His mother was a daughter of Dr. Andrew Bruce, principal of St. Leonard's College, St. Andrews.

MACKENZIE, HENRY, Scotch author, was born at Edinburgh in August, 1745, and died in 1831.

MACKEREL. Mackerels are pelagic fishes, belonging to a small family, *Scombridae*, of which the tunny, bonito, albacore, sucking fish (*Echeneis*), and a few other tropical genera are members. Although the species are fewer in number than in the majority of other families of fishes, they are widely spread and extremely abundant, peopling by countless schools the oceans of the tropical and temperate zones, and approaching the coasts only accidentally, occasionally, or periodically. The mackerels proper (genus *Scomber*) are readily recognized by their elegantly shaped, well-proportioned body, shining in iridescent colors. Small, thin, deciduous scales equally cover nearly the entire body. The dorsal fin extends over a great part of the back, and consists of several portions: the anterior, composed of feeble spines which can be laid backward in a groove; the posterior, of rays only, of which the five or six hindmost are detached, forming isolated "finlets." The shape of the anal fin is similar to that of the rayed dorsal. The caudal fin is crescent-shaped, strengthened at the base by two short ridges on each side. The mouth is wide, armed above and below with a row of very small, fixed teeth.

No other fish shows finer proportions in the shape of its body. Every "line" of its build is designed and eminently adapted for rapid progression through the water; the muscles massed along the vertebral column are enormously developed, especially on the back and the sides of the tail, and impart to the body a certain rigidity which interferes with abruptly sideward motions of the fish. Therefore mackerel generally swim in a straightforward direction, deviating sideward only when compelled, and rarely turning about in the same spot. They are in almost continuous motion, their power of endurance being equal to the rapidity of their motions. Mackerel, like all fishes of this family, have a firm flesh; that is, the muscles of the several segments are interlaced, and receive a greater supply of blood-vessels and nerves than in other fishes. Therefore the flesh, especially of the larger kinds, is of a red color; and the energy of their muscular action causes the temperature of their blood to be several degrees higher than in other fishes.

All fishes of the mackerel family are strictly carnivorous; they unceasingly pursue their prey, which consists principally of other fish and pelagic crustaceans. The fry of clupeoids, which likewise swim in schools, are followed by the mackerel until they reach some shallow part of the coast, which their enemies dare not enter.

Mackerels are found in almost all tropical and temperate seas, with the exception of the Atlantic shores of temperate South America, where they have not hitherto been met with.

The home of the common mackerel (to which the following remarks refer) is the North Atlantic, from the Canary Islands to the Orkneys, and from the Mediterranean and the Black Sea and the coasts of Norway to the United States.

Toward the spring large schools approach the coasts. Two causes have been assigned of this migration; first, the instinct of finding a suitable locality for propagating their species; and, secondly, the search and pursuit of food, which in the warmer season is more abundant in the neighborhood of land than in the open sea. It is probable that the latter is the true and only cause, for the following reasons: Mackerel are known to increase much more rapidly in size while in the neighborhood of land than in the months during which they lead a roving pelagic life in the open sea; and, further, one-year and two-year-old fishes, which have not yet attained maturity, and therefore do not travel landward for the purpose of spawning, actually take the lead in the migration landward followed later on by the older and mature fishes.

MACKINTOSH, SIR JAMES, publicist, historian, statesman, and philosopher, was born at Aldourie, seven miles from Inverness, in 1765. At a very early age young James bore the reputation of a prodigy for multifarious reading and learning. His schooling he received at Fortrose, whence he went in 1780 to college at Aberdeen. In 1784 he proceeded for the study of medicine to Edinburgh, where he found a still more congenial field for his opening mind.

In 1788 Mackintosh removed to London, then agitated by the trial of Hastings and the king's first lapse into insanity. Mackintosh was soon absorbed in the question of the time; and in April, 1791, after long meditation, he published his *Vindicie Gallica*, a reply to Burke's *Reflections on the French Revolution*. It was the only worthy answer to Burke that appeared. The success of the *Vindicie* finally decided him to give up the medical for the legal profession. He was called to the bar in 1795, and gained a considerable reputation there as well as a tolerable practice. During this period his greatest public efforts were his lectures (1799) at Lincoln's Inn on the law of nature and nations, of which the introductory discourse was published, and his eloquent defense (1803) of Jean Peltier, a French refugee, tried at the instance of the French Government for a libel against the first consul. In 1804 he was created knight, and received the post of recorder at Bombay, where he spent the next seven years of his life. In spite of his scholarly and historic sympathies, his heart always was with the new era, and he was glad to return to England, where he arrived in 1812. True to his old faith, he courteously declined the offer of Perceval to resume political life under the auspices of the dominant Tory party, though tempting prospects of office in connection with India were opened up. He entered parliament in the Whig interest as member for Nairn. He sat for that county, and afterward for Knaresborough, till his death. From 1818 to 1824 he was professor of law and general politics in the East India Company's College at Haileybury.

Already a privy counselor, Mackintosh was appointed commissioner for the affairs of India under the Whig administration of 1830. He died in 1832.

MACLAURIN, COLIN, one of the most eminent among the mathematicians and philosophers that Great Britain has produced, was the son of a clergyman, and born at Kilmodan, Argyllshire, Scotland, in 1698, and died in 1746.

M'LENNAN, JOHN FERGUSON, LL.D., one of the most original of modern inquirers into the constitution

of early society, was born at Inverness, Scotland, October 14, 1827. He died June 14, 1881.

MACLEOD, NORMAN. There were three Norman Macleods, all ministers of the Church of Scotland, and all men of some note in their day. The third Norman, our subject, was born in Campbeltown on June 3, 1812, and, like his father, he could tell a good story, only his humor was not of the pawky kind, but verged on caricature, when it had not, as it mostly had, a vein of pathos in it; for he had received, probably from his mother, Agnes Maxwell, a richer blood and a larger life than we can trace in his more purely Celtic ancestry.

When he began his ministry, the troubles in the Scottish Church were already gathering to a head, and he found himself compelled to look around, and choose his ground. He wanted to get for the church all that Chalmers and his friends wanted. He felt that the best men, both lay and cleric, were with them, and against himself. He had no love for lay patronage, and he wished the church to be free to do its proper work. But more than all else he clung in those days to the idea of a national Established Church; and it was not without a sinking of heart that he saw the long array file out of the Assembly of 1843 after Doctors Welsh and Chalmers. Yet he girded himself up for the task that had now to be done with courage and wisdom. It was a heavy job to fill 430 pulpits with such materials as came to hand, mostly men who had already failed, and practically given up the profession. For years, Macleod, and those who worked with him, toiled almost despairingly to inspire them with any living interest in the real business of the Christian Church. But in the long run his labors were crowned with a large measure of success, though his own brethren to the last hardly gave him the credit for it which was due almost to him alone—to him, at any rate, above all others.

It may be doubted if the work which Norman Macleod did for Scotland could have been done in his day without the disruption of the church. For the Evangelical party, using that word in its technical sense, had not only gained the confidence of the people by much faithful service, but also had confirmed their power by somewhat sharp treatment of all who differed from them. The church could not, however, tolerate the views of his cousin, Macleod Campbell; but as these were now, more or less, identified with the living element in the kirk, with those who were most diligent in parochial work, and most zealous in mission enterprise, they gradually established their right to be preached in Calvinistic pulpits. Norman Macleod, of course, was not long left to expend his energies on the weavers of Loudoun. Removing first to Dalkeith, he was finally, in 1851, called to the Barony church, Glasgow, where the rest of his days were passed, in honor and influence, as the foremost of its citizens. There the more liberal theology rapidly made way among a people who judged it more by its fruits than by its arguments. And, as they heard his eloquent voice pleading on behalf of churches and schools for the poor, penny savings banks, foreign missions, and every likely scheme for doing good to men, they learned to look without suspicion at opinions which yielded such Christian results.

Two other events also helped not a little to increase his influence. These were his position as editor of *Good Words*, and his relation to the queen and the royal family.

While *Good Words* made his name widely known, and helped the cause he had so deeply at heart, his relations with the queen and the royal family strengthened yet further his position in the country. Never since Principal Carstairs had any Scotch clergyman been on such

terms with his sovereign; and their friendship was felt to be alike honorable to both, resting, on her part, on esteem for his work and character, and on his, on a loyal desire to serve his queen as a Christian minister may. All this helped not a little to increase his influence in the councils of the church, and to restore its prestige, which had for a time been nearly overthrown; and yet, while his popularity was in full swing, one unlucky piece of honesty made him for a time the man in all Scotland most profoundly distrusted.

Sunday, June 16th, shortly after completing his sixtieth year, Norman Macleod peacefully fell asleep, the country hardly knowing how it had loved him till he was borne to his quiet resting-place in Campsie churchyard.

MACLISE, DANIEL, subject and history painter, was born at Cork in 1806, the son of a Highland soldier. He died on April 25, 1870.

MACLURE, WILLIAM, the pioneer of American geology, was born at Ayr in Scotland, in 1763. After a brief visit to New York he began active life as a partner in the firm of Miller, Hart & Co., London. Four years later (1796) business affairs brought him again to America, which he thereafter made his home. In 1803, he visited France as one of the commissioners appointed to settle the claims of American citizens on the French Government for spoiliations committed during the Revolution; and during the few years then spent in Europe he applied himself with enthusiasm to the study of geology. On his return home he commenced the self-imposed task of making a geological survey of the United States. Almost every State in the Union from St. Lawrence to the Gulf of Mexico was traversed and mapped by him, the Alleghany mountains being crossed and recrossed some fifty times. The results of his unaided labors were submitted in a memoir to the American Philosophical Society (1809), and published in the Society's *Transactions* (vol. vi.), together with a geological map, which thus antedates William Smith's great geological map of England by six years. Subsequent survey has corroborated the general accuracy of MacLure's observations, so far at least as the Primary and Secondary formations are concerned. From 1817 to his death MacLure was president of the Academy of Natural Sciences of Philadelphia, and much of the prosperity of the institution was due to his devoted services. In 1819 he visited Spain, and attempted to establish an agricultural college near the city of Alicante; but with the overthrow of the short-lived Liberal constitution his plans became hopelessly deranged. Returning to America in 1824, he settled for some years at New Harmony, Ind., endeavoring, but with small success, to develop his scheme of the agricultural college. Failing health ultimately constrained him to relinquish the attempt, and to seek (in 1827) a more congenial climate in Mexico. There, at San Angel, he died, March 23, 1840.

MACNEE, SIR DANIEL, portrait painter, was born in 1806 at Fintry, in Stirlingshire, Scotland. He died in 1882.

MACNEILL, HECTOR, a minor Scottish poet, born near Roslin, October 22, 1746; died at Edinburgh, March 15, 1818.

MACON, the capital of Saône-et-Loire, France, occupies a gently sloping site on the right bank of the Saône, forty-one miles north of Lyons. It is connected by a bridge of twelve arches, with the suburb of St. Laurent on the opposite bank of the river.

MACON, a city of the United States, the chief town of Bibb county, Ga., is situated on rising ground in the midst of a beautifully wooded country on both sides of the Ocmulgee river, a navigable headwater of the Altamaha, about eighty miles southeast of Atlanta.

It is well laid out with tree-bordered streets, often 180 feet wide, and possesses, since 1870, a fine central park, on the formation of which \$125,000 were expended. The principal institutions in the town are the State academy for the blind (1852), the Mercer university (a Baptist foundation, 1838), the Wesleyan Female College (1839), the Pio Nono (Roman Catholic) College, and the Southern Botanic-Medical Institute. As an important junction for the Georgia, the Georgia Central, and the Southwestern Railways, and communicating with the coast by the direct line to Brunswick, Macon enjoys great facilities for trade; and, besides its extensive railway machine-shops, it has cotton factories, iron foundries, flour-mills, and sash and blind factories. The annual fair held in the Central Park is the great meeting-place of the Georgian planters. From 5,720 in 1850 the population has steadily advanced to 8,247 in 1860, 10,810 in 1870, 12,748 in 1880, and 23,272 in 1900. The foundation of the town dates only from 1823.

MACPHERSON, JAMES, the "translator" of the Ossianic poems, was born at Ruthven, Inverness, Scotland, in 1738, was educated in his native village and at King's College, Aberdeen, and died at Belleville, an estate which he had recently purchased in Inverness, on February 17, 1796, and was buried in the Poet's Corner at Westminster Abbey.

MACREADY, WILLIAM CHARLES, was born in London, March 3, 1793, and educated at Rugby. His intention was to proceed to Oxford, but the embarrassed affairs of his father, the lessee of several provincial theaters, called him to share the responsibilities of theatrical management, in which he showed great prudence and address. In 1810 he made a successful debut as "Romeo" at Birmingham; and the fame which he had acquired in the provinces gave exceptional interest to his appearance in 1816 at Covent Garden, in the character of "Orestes" in the *Distressed Mother*. In London his choice of characters was at first confined chiefly to the romantic drama, but he showed his capacity for the highest tragic parts when he played "Richard III." at Covent Garden in 1819, and in the following year his performance of "Virginius," in the new play of Sheridan Knowles, assisted to give solidity to his reputation. Transferring his services to Drury Lane, he gradually rose in public favor, till on the retirement of Kean and Young, he was regarded as the legitimate successor of these tragedians. In 1826 he completed a successful engagement in America, and in 1828 his performances met with a very flattering reception in Paris. Already he had done something to encourage the creation of a modern English drama through the interest awakened by his performances in *Virginius*, *Caius Gracchus*, and *William Tell*, and after entering on the management of Covent Garden in 1837 he introduced, besides other new plays, Bulwer's *Lady of Lyons* and *Richelieu*, the principal characters of which were among his most effective parts. Both, however, in his management of Covent Garden, which he resigned in 1839, and of Drury Lane, which he held from 1841 to 1843, he found his designs for the elevation of the stage hampered and finally frustrated by the sordid aims of the proprietors and the absence of adequate public support. In 1843-44 he made a prosperous tour in the United States, but his last visit to that country, in 1849, was marred by a riot at the Astor Opera House, New York, arising from the jealousy of the actor Forrest, and resulting in the death of twenty-two persons, who were shot by the military called out to quell the disturbance. Macready retired from the stage in 1851; and the remainder of his life was occupied chiefly in superintending the education of his family, and in schemes for the

welfare of the poorer classes. He died at Cheltenham, April 27, 1873.

MACROBIUS, AMBROSIIUS THEODOSIUS, a Roman grammarian and philosopher, who wrote toward the beginning of the fifth century after Christ. It is possible, but by no means certain, that he was the Theodosius to whom Avianus dedicates his fables. From the date of the persons who are mentioned by him as contemporaries, he appears to have flourished in the time of Honorius.

MADAGASCAR, an important island in the Indian Ocean, and the third largest island in the world, is about 300 miles from the southeast coast of the African continent, from which it is separated by the Mozambique Channel. It is 980 miles in length from north to south, the northern point, Cape Ambro, in 12° S. latitude, inclining 16° to the east from the longitude of Cape St. Mary, the southernmost point, in 25° 35' S. latitude, so that the main axis of the island runs from north-northeast to south-southwest. The broadest portion of Madagascar is near the center, where it is nearly 350 miles across, and there it is only 230 miles distant from the African coast. From this part of the island its northern half forms a long irregular triangle, while south of it the average breadth is about 250 miles. Its total area is nearly 228,000 square miles, or not quite four times the extent of England and Wales.

Although known to Arab merchants for more than a thousand years past, and frequently visited by Europeans since the beginning of the sixteenth century, Madagascar is still but imperfectly explored. A careful survey of the coast was made in 1823-25 by Capt. W. F. W. Owen, R.N., but all maps of the interior up to about ten years ago were constructed on the most insufficient data. During the last decade many portions of the island previously unknown have been traversed by missionaries and naturalists, and maps, more or less detailed, have been prepared of a considerable portion of the interior.

Madagascar has a very regular and compact form, with but few indentations considering its great extent of shore-line. Along two-thirds of its eastern side the coast is almost a straight line, without any inlet, for Tamatave and Foule Pointe, which are the most frequented ports on this side of the island, are only open roadsteads protected by coral reefs. North of this, however, is Antongil Bay, a deep and wide inlet running northward for about fifty miles; farther north is Port Louquez, and at the extreme point of the island is Diego Suarez Bay, one of the finest harbors in the world. The northwestern side of Madagascar is broken up by a number of spacious inlets, some of them landlocked and of considerable size.

The islands around Madagascar are few and unimportant. The largest are St. Marie's, near the eastern coast, a narrow island about thirty miles long, and Nôsibé, larger and more compact in form, opposite Pâsandava Bay on the northwest coast. Except the Minnow group, north of Nôsibé, the rest are merely rocky islets, chiefly of coral.

Much light has been thrown upon the physical geography of Madagascar by recent explorations. In most accounts, up to a very short time ago, a "central mountain chain" is described as running throughout the island as a sort of backbone from north to south; and most maps show this, with numerous branches extending in various directions. It is, however, now quite clear that instead of this supposed mountain chain there is an elevated mountainous region, from 3,000 to 5,000 feet in altitude, occupying from a third to two-fifths of the whole interior, but lying more toward the north and east. Around this upper region are extensive

plains, at a much less elevation above the sea, and most developed on the western side of the island, and in its southern portion beyond 23° S. latitude. But this lower region is not entirely level, as it is broken up toward the west by three prominent lines of hills running north and south.

The shores of the greater portion of the southern half of the island are low and flat, but in the northern half much of the coast is bold and precipitous, the high land often approaching the sea. On the eastern side the plains vary from ten to fifty miles in breadth, but on the western side they often exceed 100 miles across. From these coast plains the ground rises by successive ranges of hills to the high interior land. This elevated region is broken up in all directions by mountains, the highest in the island being centrally situated as regards its length, but more to the eastern side.

In the elevated region of Madagascar are many fertile plains and valleys. The country is well watered, even in the highest ranges of the interior, the abundant rainfall giving a perennial supply to the innumerable springs and streams. There are, therefore, no extensive districts that can be called desert, except parts of the west and southwest provinces, where the rainfall is scanty.

As is necessarily the case from the physical conformation of the interior, the chief rivers flow to the west and northwest sides of the island. The eastern streams are all less in size, except the Mangoro, which flows for some distance parallel with the coast. Few of them, therefore, are of much service for navigation, except for the light-draught native canoes, and almost all of them are more or less closed at their outlets by sand-bars.

Of the western rivers, the Bétsiboka could be ascended by steamers of light draught for about ninety miles, and the Tsiribihina is also navigable for a considerable distance. The former is about 300 miles long; the latter is somewhat less, but by its affluents spreads over a greater extent of country. It brings down so large a body of water that the sea is said to be fresh three miles from the land. But owing to the height of the interior of Madagascar there is no uninterrupted water communication with it from the sea by any of the rivers, which are all crossed by rocky bars; and in some cases by grand waterfalls, as on the Mania. The eastern rivers cut their way through the ramparts of the high land by magnificent gorges, amid dense forest, and descend by a succession of rapids and cataracts.

On the eastern side of Madagascar the contest between the fresh water of the rivers and the sea has caused the formation of a long chain of lagoons for nearly 300 miles. In many parts these look like a river following the coast line, but frequently they extend out into large sheets of water. So short is the distance between these that, by cutting about thirty miles of canal to connect them, a continuous waterway could be formed for 260 miles along the coast. This will doubtless be accomplished at some future time, with great benefit to the commerce of the country.

Among the many new facts brought to light by recent research in Madagascar is the evidence of very widespread and powerful subterranean action throughout a great part of the island, apparently extending almost unbroken from the southeast to the northwest and extreme north. This volcanic belt is part of a line which has its northern extremity in the Comoro islands, all of which are volcanic in origin, and where, in Great Comoro, there is a still active vent. There is now no active volcano in Madagascar, but a large number of extinct cones have been observed in various parts of the country.

The geology of Madagascar has as yet been very im-

perfectly investigated; for few travelers have possessed the special scientific knowledge requisite to give much value to their observations; and hardly anything has yet been done toward making collections of fossils, or in procuring specimens of rocks and minerals.

The climate varies very much in different parts of the country. In the high interior districts it resembles that of the temperate zones, with no intense heat, and is quite cold during the nights in winter. These parts of the island are therefore tolerably healthy for Europeans. But the coasts are much hotter, especially on the western side; and, from the large amount of marsh and lagoon, malarial fever is prevalent, and frequently fatal both to Europeans and to natives from the interior. The seasons are two—the hot and rainy season from November to April, and the cool and dry season during the rest of the year. Rain indeed falls almost all the year round on the eastern coast, which is exposed to the vapor-laden southeast trade winds, but it is much less frequent on the west side, being intercepted by the high interior land. No snow is known even on the loftiest mountains, but thin ice is very occasionally found; and hail showers, often very destructive, are frequent in the rainy season. Terrific thunder storms are also common at that period; waterspouts are sometimes seen, and hurricanes occur every few years, at very rare intervals ascending into the interior high land.

Among the food-giving plants are rice—the staff of life to the Malagasy—in several varieties, maize, millet, manioc, yams, sweet potatoes, and numerous vegetables of European introduction. The fruits, indigenous and introduced, are the banana, peach, loquat, mango, melon, pine-apple, mulberry, orange, citron, lemon, guava, Chinese guava, fig, raspberry, tomato, and several others. Several spices are grown; ginger, sugarcane, coffee, indigo; tobacco, cotton, hemp, gourds, dye-woods, and gums are also among the vegetable productions; and gum-copal and india-rubber have been exported in considerable quantities. Besides the dense forest belt already mentioned, a great extent of the coast plains is also well wooded, as well as the river valleys in the upper part of the island; and, as many portions of the country, especially of the forests, have not yet been traversed by Europeans, its vegetable wealth is probably far from being fully known.

The fauna of Madagascar, while deficient in most of the characteristic tropical forms of life, is one of great interest to the naturalist. As a continental island, probably separated at a very remote period from the mainland, it possesses no large quadrupeds—none of the larger carnivorous, ungulate, proboscoid, or quadrumanous animals; but is the headquarters of the *Lemuridae*, no less than thirty-six of which animals are found in its forests and wooded plains. Some of these creatures are highly specialized, while the curious aye-aye (*Chiromys madagascariensis*), an allied form, is one of the most remarkable animals known, forming a genus and family by itself. Its whole structure is strangely modified to enable it to procure the wood-boring larvæ which form its food. Other peculiar animals are several species of the *Centetidae*, a family of the *Insectivora* which is almost confined to Madagascar; while of the *Carnivora* there are several small creatures belonging to the civets (*Viverridae*). The largest of the ferocious animals, also forming a genus and family by itself, is the *Cryptoprocta ferox*; it is a plantigrade animal, three feet long, but very like an enormous weasel, and attacks the largest animals with great ferocity. African humped cattle were introduced several hundred years ago into Madagascar, and now exist in large herds all over the island. The fat-tailed sheep, goats, and swine have also been naturalized, as well as all kinds of domestic poultry, which are reared

in great abundance for export as well as for home consumption.

The avi-fauna is much richer than the mammalian, and, although wanting the largest birds, as well as the most brilliantly colored, comprises more than two hundred and twenty species, nearly half of which are peculiar to the island. Many of the birds are remarkable, not so much for their shape or coloring as for their distant relationships; many belong to peculiar genera, and some are so isolated that it is very difficult to classify them, and they yet remain a puzzle to ornithologists.

The people of Madagascar, who are collectively known by the name of Malagasy, are divided into a considerable number of tribes, each having its own distinct name and customs. Although by its geographical position the country is an African island, a large portion, if not the majority, of its inhabitants appear not to be derived from Africa, but to belong to the Malayo-Polynesian stock. This is inferred from their similarity to the peoples of the Indian and Pacific archipelagoes in their physical appearance, mental habits, customs, and, above all, in their language. Their traditions also point in the same direction. There is, however, an undoubted African mixture in the western and some other tribes; and there is also an Arab element on both the northwest and southeast coasts. It is believed that there are traces of an aboriginal people who occupied portions of the interior before the advent of the present inhabitants, and these appear to have been a somewhat dwarfish race, and lighter-colored than the Malagasy generally. Of all the tribes the Hôva, who occupy the central province of Imérina, are now the dominant tribe; they appear to be the latest immigrants, and are the lightest in color; and they are also the most advanced, intelligent, and civilized of all the peoples inhabiting the island.

As regards both language and customs, there appears to be a wider difference between the Hôva and all the surrounding tribes than exists between any of these latter, although living on opposite sides of the island, far separate from one another. The most striking proof of the virtual unity of the inhabitants of Madagascar is that there is substantially but one language spoken over the whole country.

While the people are not civilized in a European sense, they are not a savage race, and some of the tribes can hardly be classed among barbarous peoples. They have never, for instance, fallen into the cannibal practices of many allied races in Polynesia; and the tribal instincts are strong among all sections of the population. They are law-obeying and loyal, living in settled communities, in villages which are often fortified with considerable skill, with a government of chiefs and elders, a development of a primitive patriarchal system.

The chief employment of the Malagasy is agriculture, a large portion of their time being spent in the cultivation of rice, their staple food. In this they show very great ingenuity, the *kêssa* grounds, where the rice is sown before transplanting, being formed either on the margins of the streams or in the hollows of the hills in a series of terraces, to which water is often conducted from a considerable distance. In this agricultural engineering no people surpass the Betsiléo tribes. No plow is used, but all work is done by a long-handled spade; and oxen are only employed to tread out the soft mud preparatory to transplanting. The other processes are very primitive: the rice is threshed by being beaten in bundles on stones set upright on the threshing-floor; and when beaten out the grain is stored by the Hôva in rice-pits dug in the hard red clay, but by the coast tribes in small timber houses raised on posts to protect them from vermin. In preparing the rice for use it is pounded in a wooden

mortar to remove the husk, this work being always done by the women. The manioc root is also largely consumed, together with several other roots and many vegetables; but little animal food (save fish and freshwater *Crustacea*) is taken by the mass of the people except at festival times. Rice is used less by the western tribes than by those of the central and eastern provinces, and the former people are more nomadic in their habits than are the others. Large herds of fine humped cattle are kept almost all over the island.

The central and eastern peoples have a considerable amount of manual dexterity. The women spin and weave, and with the rudest appliances manufacture a variety of strong and durable cloths of silk, cotton, and hemp, and of rôfia palm, aloe, and banana fiber, of elegant patterns, and often with much taste in color. They also make from straw and papyrus peel strong and beautiful mats and baskets in great variety, some of much fineness and delicacy, and also hats resembling those of Panama. The people of the south and southeast make large use of soft rush matting for covering, and they also prepare a rough cloth of bark. Their non-employment of skins for clothing is a marked distinction between the Malagasy and the South African races, and their use of vegetable fibers an equally strong link between them and the Polynesian peoples. The ordinary native dress is a loin-cloth or *salàka* for the men, and a *kitàmby* or apron folded round the body from waist to heel for the women; both sexes use over this the *làmba*, a large square of cloth folded round the body something like the Roman *toga*. The Malagasy are skillful in metal working; with a few rude looking tools they manufacture silver chains of great fineness, and filagree ornaments of both gold and silver. Their iron-work is of excellent quality, and in copper and brass they can produce copies of anything made by Europeans. They display considerable inventive power, and they are exceedingly quick to adopt new ideas from Europeans.

There is a considerable variety in the houses of the different Malagasy tribes. The majority of Hôva houses are built of layers of the hard red clay of the country, with high-pitched roofs thatched with grass or sh. The chiefs and wealthy people have houses of framed timber, with massive upright planking, and lofty roofs covered with shingles or tiles. The forest and coast tribes make their dwellings chiefly of wood framing, filled in with the leaf-stalks of the traveler's tree, with the leaves themselves forming the roof covering. The houses of the Betsiléo and Sakalàva are very small and dirty, but those of the coast peoples are more cleanly and roomy. Among the Hong the Hôva and Betsiléo the old villages were always built for security on the summits of lofty hills, around which were dug several deep fosses, one within the other. In other districts the villages and homesteads are enclosed within formidable defenses of prickly pear or thorny mimosas.

The country is very deficient in means of communication. There are no roads or wheeled vehicles, so that all goods are carried either by canoes, where practicable, or on the shoulders of bearers along the rough paths which traverse the country, and which have only been formed by the feet of the travelers. Intercourse between distant portions of the island is therefore very limited, but a large quantity of European goods is brought up to the capital city and its neighborhood, and a good deal of native produce is taken down to the coast. Commerce is gradually increasing, as shown by the consular returns, the chief articles of export being bullocks, rice, hides, rôfia palm cloths (*rabànnas*) and fiber, and also gum-copal and india-rubber, although the yield of these products has latterly much diminished.

Coffee is being planted to some extent by creole traders, and is likely to become a staple article of export, and from the natural fertility of the soil almost unlimited quantities of most tropical produce could be obtained—sugar, coffee, rice, cotton, tobacco, indigo, spices, etc. The chief imports are European and American calicoes and prints, hardware, and spirits. On the west coast a sea-going canoe with outrigger is employed, but in the southeast an ingeniously constructed boat, with all the timbers tied together, is used for going through the heavy surf. A considerable number of European traders are scattered along the coasts, especially at Tamatave and other eastern seaports, and there is a large Arab and Indian community in the northwestern ports. There is no native coinage, but the French five-franc piece or dollar is the standard, and all sums under that amount are obtained by cutting up these coins into all shapes and sizes, which are weighed with small weights and scales into halves, quarters, eighths, twelfths, and twenty-fourths of a dollar, and are even reckoned down to the seven-hundred-and-twentieth fraction of the same amount.

Apart from the modern influence of religious teaching, the people are very immoral and untruthful, disregardful of human life and suffering, and cruel in war. Until lately polygamy has been common among all the Malagasy tribes, and divorce effected in an absurdly easy fashion. At the same time the position of woman is much higher in Madagascar than in most heathen countries; and, since for more than fifty years past there have been (with a few months' exception) only female sovereigns, this has helped to give women considerable influence in native society.

In their religious notions and practices the Malagasy seem to occupy a middle position among heathen peoples. On the one hand, they have never had any organized religious system or forms of worship; there are no temples, images, or stated seasons of devotion, nor is there a priesthood, properly so called. On the other hand, they have never been without some distinct recognition of a Supreme Being, whom they call "The Fragrant One," and "The Creator"—words which are recognized all over the island.

The political history of Madagascar as a whole may be said to date from the reign of Radama I. (1810-28). The ancestors of that king had been merely chiefs of the central provinces, but he was the first to claim the right of conquest to be supreme ruler of the whole island, although actually exercising authority over less than two-thirds of its surface. Radama was a man much in advance of his age—shrewd, enterprising, and undeterred by difficulty—a kind of Peter the Great of his time. He saw that it was necessary for his people to be educated and civilized, if the country was to progress; and making a treaty with the governor of Mauritius to abolish the export of slaves, he received every year in compensation a subsidy of arms, ammunition, and uniforms, as well as English training for his troops. He was thus enabled to establish his authority over a large portion of the island, and, although this was often effected with much cruelty, the ultimate results were beneficial. Although these changes have as yet only affected about a fourth part of the whole population, there is reason to believe that the influences at work in the center of the island will eventually affect all the different tribes. Missionary work is also carried on by English Episcopalians (S. P. G.), Norwegian Lutherans and French Roman Catholics.

The government of Madagascar during the present century has been and still is monarchical, theoretically despotic, but practically limited in various ways. Radama I., and Ranaivalona I., were much more absolute

sovereigns than those before or after them, but even they were largely restrained by public opinion. New laws are announced at large assemblies of the people, whose consent is asked, and always given through the headmen of the different divisions of native society; and this custom is no doubt a "survival" from a time when the popular assent was not a merely formal act, as it has now almost entirely become. The large disciplined army formed by Radama I. aided much in changing what was formerly a somewhat limited monarchy into an absolute one. The Hova queen's authority is maintained over the central and eastern portions of Madagascar, and at almost all the ports, by governors appointed by the queen, and supported by small garrisons of Hova troops. At the same time the chiefs of the various tribes are left in possession of a good deal of their former honors and influence, so long as they acknowledge the suzerainty of the Hova sovereign, and perform a certain amount of government service. The present queen and her predecessor have both been married to the prime minister, a man of great ability and sagacity, who, by his position as husband and chief adviser of the sovereign, is the virtual ruler of the country. Chiefly owing to his influence, the last five or six years have been marked by the introduction of several measures tending to modify the government of the country and improve the administration. The purpose of these new laws is to weaken the old oppressive feudal system; to remodel the army; to appoint a kind of local magistracy, and registrars; to encourage education; and to form a responsible ministry, with departments of justice, war, education, agriculture, commerce, revenue, etc.

Owing to the conservative habits of the people, considerable time will probably elapse before all these measures are carried into effect, but their mere enactment is a proof of the progress of enlightened ideas. Until lately the military service has been very oppressive upon certain classes, being for life, and without any pay; but it is now to be compulsory upon all, and for short periods only. The Hova army has been variously estimated at from 30,000 to 40,000 men, although it is popularly termed *ny Fôdo-àlin-dàhy*, i. e., "the Ten thousand men." Military rank is reckoned by numbers, from one "honor," that of a private, to sixteen "honors," the rank of the highest officer; but several of the English words for different ranks are employed, as a sergeant, captain, general, marshal, etc. Justice has hitherto been administered by a number of unpaid judges appointed by the sovereign, and they generally sit in the open air. There appears to be a somewhat small amount of crimes of violence; but cattle stealing raids made by one tribe upon another are a frequent cause of petty wars away from the Hova authority. The revenue of the government is derived from customs duties, first fruits, fines and confiscation of offenders' property, and a money offering called *hâsina*, presented on a great variety of occasions both to the sovereign in person and to her representatives; and these are supplanted by "benevolences" (in the mediæval sense of the word) levied upon the people for occasional state necessities. Besides these, the Government claims the unpaid services of all classes of the community for all kinds of public work. Consuls appointed by the English, French, and American Governments are accredited to the Malagasy sovereign, and the queen has a consul in England, and a consular agent at Mauritius.

Antananarivo, the capital of Madagascar, is by far the largest city in the island. It has about 50,000 inhabitants, and has been almost rebuilt during the last twelve years, the old timber and rush houses being nearly all replaced by much larger and more substantial

ones of sun-dried brick and stone, constructed in European fashion. A group of royal palaces, with lofty roofs and stone-arched verandas, crowns the summit of the ridge on and around which the city is built, and hardly less conspicuous is the grand new residence of the prime minister. Four handsome stone memorial churches, with spires or towers, mark the spots where the Christian martyrs suffered; and other prominent buildings are the Chapel Royal, the Norwegian and Roman Catholic churches, the London Missionary College, the London Missionary Society and the Friends' normal schools, mission hospitals, the court of justice, and numerous large Congregational churches of sun-dried brick. Pop. of island (1901), 2,244,872.

MADDALONI, a city of Italy, in the province of Caserta (Terra di Lavoro), about three and one-half miles southeast of Caserta, with a station both on the railway from Caserta to Benevento and on that from Caserta to Avellino.

MADDEN, SIR FREDERIC, one of the first palæographers and antiquaries of his time, and for nearly forty years assistant keeper and keeper of manuscripts at the British Museum, was born at Portsmouth on February 16, 1801, and died in 1873.

MADDER, or DYER'S MADDER, is the root of *Rubia tinctorum*, L., and perhaps of *R. peregrina*, L., as well, both being European; but *R. cordifolia*, L., and perhaps *Mungista*, Roxb., a native of the mountains of Nepal, Bengal, Japan, etc., supply the Indian madder or *manjit*. *Rubia* is a genus of about thirty species of the tribe *Galieæ* of the order *Rubiaceæ*, and much resembles the familiar *Galiums*, e.g., the lady's bedstraw and cleaver of English hedges having similarly whorled leaves, but the parts of the flowers are in fives and not fours, while the fruit is somewhat fleshy. The sole British species is *Rubia peregrina*, L. The use of madder appears to have been known from the earliest times, as cloth dyed with it has been found on the Egyptian mummies. It was used for dyeing the cloaks of the Libyan women in the days of Herodotus. *Rubia tinctorum*, L., a native of western Europe, etc., has been extensively cultivated in south Europe, France, where it is called *garance*, and Holland, and to a small extent in the United States. Large quantities have been imported into England from Smyrna, Trieste, Leghorn, etc. The cultivation, however, is decreasing since alizarin, the red coloring principle of madder, has been made artificially (see ALIZARIN). Madder was employed medicinally by the ancients and in the middleages.

MADEIRA. The Madeiras, a group of islands in the North Atlantic Ocean belonging to Portugal, consist of two inhabited islands named Madeira and Porto Santo, and three uninhabited rocks named collectively the Desertas. Funchal, the capital of Madeira, is on the south coast of the principal island, and about 360 miles from the coast of Africa, 535 miles from Lisbon, 1,215 from Plymouth, 240 from Teneriffe, and 480 from Santa Maria, the nearest of the Azores. Funchal is connected by the Brazilian submarine telegraph, which belongs to a British company, with Lisbon on the one hand, and on the other with Brazil.

Madiera, the largest island of the group, has a length of thirty geographical miles, an extreme breadth of thirteen miles, and a coast-line of eighty or ninety miles. Its longer axis lies east and west, in which direction it is traversed by a mountain chain, the backbone of the island, having a mean altitude of 4,000 feet, up to which many deep ravines penetrate from both coasts. The depth and narrowness of the ravines, the loftiness of the rugged peaks that tower above them, the bold precipices of the coast, and the proximity of the sea afford many scenes of picturesque beauty or

striking grandeur which are continually changing in character as the traveler advances on his way. It has been conjectured, but on insufficient evidence, that the Phœnicians discovered Madeira at a very early period. Pliny mentions certain Purple or Mauretanian Islands, the position of which with reference to the Fortunate Islands or Canaries might seem to indicate the Madeiras. On the evidence of a portulano dated 1351, preserved at Florence, it would appear that Madeira had been discovered long previous to that date by Portuguese vessels under Genoese captains. In 1419 two of the captains of Prince Henry of Portugal were driven by a storm to the island called by them Porto Santo, or Holy Port, in gratitude for their rescue from shipwreck. The next year an expedition was sent out to colonize the island, and, Madeira being descried, they made for it, and took possession on behalf of the Portuguese crown. The islands were then uninhabited. For the sixty years intervening between 1580 and 1640, Madeira, with Portugal itself, was under Spanish rule. In 1801 British troops occupied the island for a few months, commanded by General Beresford, and it was again under the British flag from 1807 to 1814. Madeira is now a province and an integral part of the Portuguese kingdom, entitled to send deputies to the Cortes assembling at Lisbon.

The inhabitants are of Portuguese descent, with probably some intermixture of Moorish and Negro blood among the lower classes. The dress of the peasantry, without being picturesque, is peculiar. Both men and women in the outlying country districts wear the *carapuça*, a small cap made of blue cloth, in shape something like a funnel, with the pipe standing upward. The men have trousers of linen, drawn tight and terminating at the knees; a coarse shirt enveloping the upper part of their person, covered by a short jacket, completes their attire, with the exception of a pair of rough yellow boots. The women's outer garments consist of a gaudily colored gown, made from island material, with a small cape of coarse scarlet or blue woolen cloth. At the end of 1900 the inhabitants of Madeira numbered 150,528 persons, the females exceeding the males by 7,060.

The administration of affairs is in the hands of a civil governor appointed by the crown, under whom is a military officer in command of the troops, which consist of a battalion of infantry, a detachment of artillery, and some militia. A bishop is at the head of the clergy, his cathedral being at Funchal. There are forty-eight parishes, each with its church and resident priest. Roman Catholicism is the established form of religion, but others are now tolerated.

The two staple productions of the soil are wine and sugar. The vine was introduced from Cyprus or Crete soon after the discovery of the island by the Portuguese, but it was not actively cultivated until the early part of the sixteenth century. The vines, after having been totally destroyed by the oidium disease, which made its first appearance in the island in 1852, were replanted, and in a few years wine was again made. The disease is now kept in check by the application of sulphur, which has the effect of increasing the quantity of fruit, while it shortens the life of the plant. The phylloxera has also made its way to the island, and every vineyard in Madeira is more or less affected by it. The wine usually termed Madeira is made from a mixture of black and white grapes, which are also made separately into wines called Tinta and Verdelho, after the names of the grapes. Other high-class wines, known as Bual, Sercial, and Malmsey, are made from varieties of grapes bearing the same names. The exported Madeira is a strong-bodied wine of fine bouquet and excellent quality.

The sugar cane is said to have been brought from Sicily about 1452, and in course of time its produce became the sole staple of the island. The grain produced on the island (principally wheat, barley, and Indian corn) is not sufficient for the consumption of the people.

Funchal, the capital of the archipelago, lies on the south coast of Madeira, and has a population of about 18,000 persons, the immediate neighborhood being inhabited by nearly as many more.

MADISON, the county seat of Jefferson county, Ind., is situated on the north bank of the Ohio, ninety miles below Cincinnati, and forty-four above Louisville, with which it has daily steamboat communication. As the terminus of one of the divisions of the Jeffersonville, Madison, and Indianapolis Railroad, Madison commands extensive means of traffic; and its provision trade especially has attained important dimensions. The population was 8,945 in 1880, and 7,835 in 1900.

MADISON, the capital of Wisconsin, and seat of justice of Dane county, lies toward the south of the State, seventy-five miles west of Milwaukee. In the beauty of its situation it has few rivals, occupying as it does the undulating isthmus between Mendota and Monona, two of the lakes which give name to the Four Lake Region, connected with the Mississippi by Yahara or Catfish river and Rock river; and the cool summer climate, which it owes to the fact that it stands 788 feet above the level of the sea, and 210 feet above Lake Michigan, renders it a health resort of some value, especially for consumptive patients. The State capitol, situated in the midst of a finely wooded park of thirteen acres, is a rather imposing but hybrid edifice of white limestone crowned by a central dome rising 200 feet above the level of the basement; it was originally built in room of an earlier capitol in 1860, at a cost of \$400,000, and has since been greatly enlarged. About a mile to the west of the capitol stand, on the high grounds known as College hill, the buildings of the Wisconsin university, an institution dating from 1850, and attended by about 800 students. Other buildings of note are the United States post-office and court-house, the soldiers' orphans' home, and at some distance from the city the State lunatic asylum. The Wisconsin Historical Society has a library of 58,000 volumes. Various lines belonging to the Chicago and North-Western Railway and to the Chicago, Milwaukee, and St. Paul Railway meet at Madison; and the city not only has a good general trade, but manufactures plows and other agricultural implements, wagons, woolen goods, and flour. The population, which was only 1,525 in 1850, appears in the three later censuses as 6,611, 9,176, and 10,325, and is now (1900), 19,104. When the site was selected (1836) for the capital of the Territory of Wisconsin it was altogether unoccupied.

MADISON, JAMES, fourth president of the United States, was born in King George county, Va., on March 16, 1751, during a temporary visit of his mother to her relatives. His father was the owner of large landed estates in Orange county, Va., and was a man of distinction in the county. In 1769 Madison entered Princeton College in New Jersey, and graduated as B.A. in 1771, but he remained another year at Princeton, studying under the direction of President Witherspoon. His close application to study had seriously impaired his health, which continued delicate for many years. Returning to Virginia in 1772, he pursued his reading and studies, however, with the same zeal as before, the subjects chosen being particularly those of philosophy, theology, and law.

Madison had as yet taken no active part in the exciting politics of the time. In 1775, however, he was chairman of the committee of public safety for Orange

county, and in the spring of 1776 he was chosen a delegate to the new Virginia convention, which formed a constitution for the State. Failing to be reelected in 1777, he was chosen in that year a member of the council of state, in which he took a prominent part until the end of 1779, at which time he was elected a delegate to the Continental Congress, later the Congress of the Confederation. It was in this assembly that Madison first displayed those powers which ultimately made him the founder of the constitution of the United States. He was in Congress during the final stages of the revolutionary war, and was among the first to advocate the granting of additional powers to Congress. In 1781 he favored the amendment of the articles of confederation, giving to Congress the power to enforce its requisitions, and in 1783 he zealously advocated the proposed plan by which the States should grant to Congress, for a period of twenty-five years, the authority to levy an impost duty. Accompanying this plan was an address to the States, drawn up by Madison. This address is one of the ablest of his state papers, and with others of this period placed him in the front rank of American statesmen.

In November, 1783, the constitutional limit of his term as deputy having expired, Madison returned to Virginia, and the next year he again took a seat in the legislature of that State. As chairman of the judiciary committee, he was particularly instrumental in revising the statute laws of the State. He opposed the further issue of paper money by the State, and tried to induce the legislature to reveal the law confiscating British debts.

Virginia and Maryland possessing a common jurisdiction over the waters of the Potomac river and the Chesapeake Bay, it became necessary to come to some agreement between them as to the commerce and navigation upon those waters. On Madison's proposal, commissioners of the two States met at Mount Vernon in March, 1785. Maryland having proposed to invite the States of Pennsylvania and Delaware to join in the arrangement, Madison saw an opportunity for a more extended and general concert in regard to commerce and trade, and proposed that all the States should be invited to send commissioners to take into consideration the trade of the United States. This resolution was adopted by the legislature of Virginia; and thus was inaugurated the movement which led to the meeting at Annapolis in 1786, and later to the convention at Philadelphia in 1787. The palpable defects in the government of the confederation had led Madison to make an extended study of confederacies, ancient and modern. His conclusion was that no confederacy could be long successful which acted upon states only, and not directly upon individuals.

As the time for the meeting of the convention approached, he drew up an outline of a new system of government to take the place of the articles of confederation.

These ideas, somewhat modified and extended in details, formed the Virginia plan of government, presented in the convention by Edmund Randolph; and this plan, again, became the basis of the extended deliberations in the convention which resulted in the constitution adopted in that body on September 17, 1787. In the convention, as a delegate from Virginia, Madison took a leading part in the debates, of which he kept notes which were afterward published by order of Congress. It was his influence which largely shaped the form of the final draft of the constitution. But the labor was not finished with this draft; the constitution was yet to be accepted by the people; that it was accepted was due in an eminent degree to the efforts of

Madison. In order to place the new constitution before the people in its true light, and to meet objections brought against it, he joined Hamilton and Jay in the publication of a series of essays, which were published in a collected form in 1788 under the name of *The Federalist*, and which are still worthy of careful study. In the Virginia convention for ratifying the constitution he was again called upon to defend that instrument, and against such staunch patriots as Patrick Henry and George Mason. Although he remained in the public service for nearly twenty-five years longer, his greatest work was finished with the adoption of the constitution. He had gained the well-earned title of "father of the constitution." The part he had taken, however, alienated from him the support of a majority of the people of his state. He was defeated as a candidate for United States senate, though he was chosen in his own district as representative to Congress. Taking his seat in the Lower House in April, 1789, he assumed a leading part in the legislation necessary to the organization of the new government. To Hamilton's measures, however, for the funding of the debt, the assumption of the state debts, and the establishment of a national bank, he was opposed. On other questions, too, he sided with the Anti-Federalists, and gradually assumed the leadership of the opposition in the House of Representatives.

Madison opposed the foreign policy of the administration in 1793-96, in its attempts to maintain a neutral position between Great Britain and France, then at war with each other. Under the signature of "Helvidius" he published in the public journals five papers of great power and acuteness, criticising the "monarchical prerogative of the executive" as exercised in the proclamation of neutrality of 1793, and the right of the recognition by the president of foreign states. So far as the question of international law was concerned, Madison was essentially right, but in regard to the authority of the executive, and the question of expediency of Washington's neutral policy, the subsequent practice of the government and the general verdict of history condemn his view. In 1794 Madison introduced in the House of Representatives resolutions based upon Jefferson's report on commerce, advising retaliatory measures against Great Britain and a discrimination in commercial and navigation laws in favor of France. Again, in 1796 he strenuously opposed the appropriation of money for the purpose of carrying into effect the treaty of 1794 with Great Britain. He scouted the idea as visionary that Great Britain would go to war on a refusal to carry the treaty into effect. It was not conceivable, he thought, that she would "make war upon a country which was the best market she had for her manufactures." It had been a favorite theory with Madison, as with Jefferson, that foreign nations could be coerced through their commercial interests. The fallacy of this doctrine was well exemplified by its utter inefficiency when put in practice by them in 1807-12.

In 1797 Madison withdrew to private life, though not to a life of inactivity. In 1798 he was induced by Jefferson to join in a movement in opposition to the Alien and Sedition Laws passed by the Federalists in that year, and was himself the author of the Virginia resolutions.

These resolutions, with those of Kentucky drawn by Jefferson, met with decided objections from the other States. Upon these objections Madison made a report to the legislature of Virginia, consisting of an elaborate and carefully considered argument sustaining in every point the resolutions of 1798. Thirty years later these arguments were freely made use of by Calhoun and his school of nullifiers as the basis of their doctrine. But Madison, in 1830, repudiated the idea that the resolu-

tions of 1798 involved the principles of nullification. He wrote at that time many letters to public men, and especially one to Edward Everett, in August, 1830, to prove this position. The nullifiers were not convinced, however, by this reasoning, and continued to use his arguments in favor of their doctrine, till it became a source of great annoyance to him.

With the rise of the republican party to power in 1801, Madison became secretary of state in Jefferson's cabinet. The most important of his papers during this period was *An Examination of the British Doctrine which subjects to capture a neutral trade not open in time of peace*, that is, the so-called "rule of the war of 1756," as extended by Great Britain in 1793 and 1803. This treatise, published in 1806, was an argument against the British doctrine, drawn from a careful investigation of authorities on international law, and was a valuable contribution to the discussion of a question which, for various reasons, has now lost its importance.

In 1809 Madison was elected president to succeed Jefferson, whose peace policy—a policy of commercial restrictions to coerce Great Britain and France—he continued to follow until, in 1812, he was forced by his party to change it for a policy of war. He had been, under the lead of Jefferson, a great lieutenant; he had for the most part furnished the arguments in support of the republican policy since 1790; but he did not possess the qualities of a leader. His cabinet was in part forced upon him in 1809 by a senatorial clique, and his administration lacked vigor, particularly during the war of 1812-15.

Madison served two terms as president, and in 1817 retired to Montpelier, his country seat in Virginia. For nearly twenty years thereafter he was engaged in agricultural pursuits, but was ever interested in literature and politics. To the time of his death he continued to be consulted by statesmen as an oracle on all constitutional questions. His death occurred on June 28, 1836.

MADRAS, a presidency of British India, occupying, with its dependencies, the entire south of the Indian peninsula, and washed on the east by the Bay of Bengal and on the west by the Indian Ocean. The north boundary is extremely irregular. On the extreme northeast is the Bengal province of Orissa; then the wild highlands of the Central Provinces; next the dominions of the nizám of Hyderabad; and lastly, on the northwest, the Bombay districts of Dhárwár and North Kánara. The extreme length from northeast to southwest is about 950 miles, and the breadth 450 miles; the area of the British districts is 141,228 square miles, and the population in 1901 was 38,208,609. The five native states attached to Madras—Travancore, Cochin, Pudukottah, Banganapalli, and Sandur—have an additional area of 9,092 square miles, and a population of 10,754,517, making a grand total area of 151,320 square miles, with a population (1901) of 48,963,126.

General Aspect.—From a physical point of view, the Madras presidency may be roughly divided into three tracts—(1) the long and broad east coast, (2) the shorter and narrower west coast, and (3) the high interior tableland. These divisions are determined by the great mountain ranges of the Eastern and Western Gháts. The Eastern Gháts form a continuation of the confused hill system of Chetiá Nágpur.

The mineral wealth of the province is as yet undeveloped. Iron of excellent quality has been smelted by native smiths in many localities from time immemorial; but attempts to work the beds after European methods have hitherto proved unsuccessful.

The Forest Department of Madras was first organ-

ized in 1856, and it is estimated that forests cover a total area of more than 5,000 square miles, the whole of which is under conservancy rules. For supplying fuel to the railways an area of about 160,000 acres is strictly conserved. In the remaining forests, after supplying local wants, timber is either sold direct by the department, or licenses are granted to wood-cutters. The more valuable timber-trees comprise teak, ebony, rosewood, sandal-wood, and redwood.

The wild animals are those for the most part common to the rest of India. Those deserving mention are the elephant, bison, sambur, and ibex of the Western Gháts and the Nilgiris. Bison are also found in the hill tracts of the Northern Circars. In Travancore state the black variety of leopard is not uncommon. In 1880-81 182 persons and 11,628 cattle were returned as killed by wild beasts. The number of persons killed by snake-bites in 1880 was 928. The elephant is now protected by law from indiscriminate destruction.

The first census, in 1822, returned the population as 13,476,923, and an enumeration in 1866-67, gave 26,539,052. According to the preliminary return the total population at the census in 1901 was 38,208,609 (19,000,230 males and 19,208,379 females). Hindus numbered 28,863,978; Mohammedans, 1,857,857; Christians, 533,760; Jains, 21,254; and "others," 4,328. The Hindus (92.3 per cent. of the whole) are subdivided into 16,159,610 Sivaïtes, 11,657,311 Vishnuvites, 154,989 Lingáyats, and 892,068 "others," including hill tribes.

Christians are more numerous in Madras than in any other part of India. They number in the British districts 533,760, of whom 40,879 are Europeans or Eurasians, and the remainder, native converts; Roman Catholics number 397,071, and Protestants, 93,228. In Travancore and Cochin states the native Christians are still more numerous, constituting as much as one-fourth of the population. The Roman Catholics, whose number throughout southern India is estimated at upward of 650,000, owe their origin to St. Francis Xavier, and the famous Jesuit mission of Madura; they are partly under the authority of the archbishop of Goa, and partly under twelve Jesuit vicariates. Protestant missions date from the beginning of the last century. The Danes were the pioneers; but their work was taken up by the Society for Promoting Christian Knowledge, under whom labored the great Lutherans of the last century—Schultz, Sartolius, Fabricius, and Schwartz. The Church Missionary Society entered the field in 1814; and subsequently an American mission joined in the work. The total number of Protestant native Christians in southern India (British and native) in 1878, was 296,408.

Urban life may be said to be more highly developed in Madras than in Bengal or Bombay. Populous cities, indeed, are not numerous, but there is an unusual proportion of towns with from 2,000 to 20,000 inhabitants. The six cities with a population of more than 50,000 are—Madras city (1901), 509,397; Trichinopoly, 104,690; Tanjore, 57,605; Madura, 105,501; Bellary, 57,700; Salem, 70,627.

Over the greater part of the area of Madras artificial irrigation is impossible, and cultivation is dependent upon the local rainfall, which rarely exceeds forty inches a year, and is liable to fall irregularly. The Malabar coast is the only part where the rainfall brought by the southwest monsoon may be trusted both for amount and for regularity. Other districts, such as Bellary, are also dependent upon this monsoon, but in their case the rain clouds have spent themselves in passing over the Western Gháts, and cultivation becomes a matter of hazard. Over the greater part of

the presidency the rainy season is caused by the south-east monsoon, which breaks about the end of September. The deltas of the Godávári, Kistna, and Káveri rivers are the only spots on the east coast which artificial irrigation is able to save from risk of occasional scarcity. Of the total cultivated area about 80 per cent. is returned as "dry" land, or that which is solely dependent upon local rainfall; 15 per cent. as "wet" land, irrigated from river channels; 2 per cent. as garden land, irrigated from wells; and about 3 per cent. fallow and pasture. The principal food staples are rice, *cholam*, *kambu*, *ragi*, and *varagu*.

Madras possesses few staple manufactures. The preparation of the coffee berry for export constitutes the one great business carried on by means of European capital and under European supervision. Indigo is manufactured in considerable quantities, but of inferior quality. The more important of the large manufactories are three cotton mills in Madras, a weaving establishment maintained by the Basel mission in South Kánara, sugar works in Ganjam and South Arcot, and a jute factory at Vizagapatam. Up to the close of last century cotton goods constituted the main article of export. Masulipatam, where the first English factory on the Coromandel coast was established in 1620, enjoyed a special reputation for its chintzes, which were valued for the freshness and permanency of their dyes. There is still a small demand for these articles in Burmah, the Straits, and the Persian Gulf; but Manchester goods have nearly beaten the Indian exporter out of the field. Native looms, however, still hold their own in the local market, in face of strenuous opposition. After weaving, working in metals appears to be the most widespread native industry. Among local specialties which have attracted European curiosity may be mentioned the jewelry of Trichinopoly, ornaments of ivory and horn worked at Vizagapatam and sandal-wood carving at Kánara. The manufacture and sale of salt is a government monopoly, carried on under close supervision. The process employed is solar evaporation, and the entire eastern coast line from Orissa to Cape Comorin affords natural facilities for the industry. The preparation of arrack and toddy spirit is also a government monopoly. On the Nilgiri hills and at Bellary country beer is manufactured by European firms subject to an excise duty of 6d. (12 cts.) per gallon.

Two guaranteed railway companies, the Madras and South Indian, have their lines almost entirely within the presidency. The total length open in 1881 was 858 miles. The continuous seaboard of the Madras presidency, without any harbors of the first rank, has tended to create a widely diffused trade. Madras city conducts nearly one-half of the total sea-borne commerce; next comes Malabar, containing the western railway terminus near Calicut; then Godávári, with its cluster of ports round the fringe of the delta; Tinneveli, with the new harbor at Tuticorin, which has opened large dealings with Ceylon; Tanjore, South Kánara, Ganjam and Vizagapatam in the order given. The total foreign trade in 1880-81 was as follows: The imports amounted to £6,518,783, of which cotton piece goods and twist made up £2,908,379, grain £158,144, and apparel £147,691. The exports amounted to £9,271,345, the chief items being—coffee, £1,393,090; raw cotton, £939,127; hides and skins, £1,261,182; rice, £996,314; seeds, £708,390; indigo, £693,103; spices, £379,282; oils, £372,119; sugar, £301,670. The total number of vessels engaged in foreign trade that cleared and entered Madras ports in 1880-81 was 6,247, with a tonnage of 1,177,337; the coasting trade was conducted by 11,316 vessels, with 3,748,474 tons, for ports outside the Madras presidency, and 24,957

vessels, with 3,092,286 tons, for ports within the presidency. The importance of this active coasting trade may be gathered from the fact that in 1876-77 (the first year of the late famine) the imports of grain suddenly rose to 652,850 tons, by far the greater part consisting of rice from Bengal.

The supreme executive authority is vested in the governor, with a council of three members, of whom one is the commander-in-chief; the others belong to the covenanted civil service. For legislative purposes this council is increased by the presence of the advocate-general and from four to eight other members nominated by the governor, of whom not less than one-half must be non-officials. The local administration is organized with the district or *zila* as its unit. Of these districts there are twenty-one in all, including the Nilgiris and Madras city, both of which occupy an exceptional position.

The climate varies in different parts of the presidency, being determined by the very diverse geographical conditions. The Nilgiri hills enjoy the climate of the temperate zone, with a moderate rainfall, and a thermometer rarely exceeding 80° F., and sometimes falling to the freezing-point. On the Malabar coast the southwest monsoon brings an excessive rainfall, reaching 150 inches in the year at certain spots. The rain clouds hanging on the slope of the Western Ghâts sometimes obscure the sun for month after month. Along the eastern coast and on the central table-lands the rainfall is comparatively low, but the heat of the summer months is excessive. At Masulipatam the thermometer frequently rises to above 110° F. in the shade. The whole coast of the Bay of Bengal is liable to disastrous cyclones, which not only wreck the shipping in the roads, but have repeatedly overwhelmed the low-lying ports. The most prevalent diseases are fevers, diarrhoea, dysentery, and other bowel complaints, cholera, and smallpox.

Until the English conquest the whole of southern India had never acknowledged a single ruler. The difficult nature of the hill passes and the warlike character of the highland tribes forbade the growth of great empires, such as succeeded one another on the plains of Hindustán. The Tamil country in the extreme south is traditionally divided between the three kingdoms of Pandya, Chola, and Chera. The west coast supplied the nucleus of a monarchy which afterward extended over the highlands of Mysore, and took its name from the Carnatic. On the northeast the kings of Kalinga at one time ruled over the entire line of seaboard from the Krishna to the Ganges. Hindu legend has preserved marvelous stories of these early dynasties, but our only authentic evidence consists in their inscriptions on stone and brass, and their noble architecture. The Mohammedan invader first established himself in the south in the beginning of the fourteenth century. Alá-ud-dín, the second monarch of the Khiljí dynasty at Delhi, and his general Malik Kafur conquered the Deccan, and overthrew the kingdoms of Karnataka and Telingána, which were then the most powerful in southern India. But after the withdrawal of the Musalmán armies the native monarchy of Vijayanagar arose out of the ruins. This dynasty gradually extended its dominions from sea to sea, and reached a pitch of prosperity before unknown. At last, in 1565, it was overwhelmed by a combination of the four Mohammedan principalities of the Deccan. At the close of the reign of Aurangzeb, although that emperor nominally extended his sovereignty as far as Cape Comorin, in reality South India had again fallen under a number of rulers who owned no regular allegiance. The nizám of the Deccan, himself an independent sovereign, represented the distant court of Delhi. The most powerful of his feudatories was the nawáb of the Carnatic, with his capital at Arcot.

In Tanjore, a descendant of Sivaji ruled; and on the central table-land a Hindu chieftain was gradually establishing his authority and founding the state of Mysore, destined soon to pass to a Mohammedan usurper.

Vasco da Gama cast anchor off Calicut on May 20, 1498, and for a century the Portuguese retained in their control the commerce of India. The Dutch began to establish themselves on the ruin of the Portuguese at the beginning of the seventeenth century, and were quickly followed by the English, who established themselves at Calicut and Cranganore in 1616. Tellicherry became the principal British emporium on the west coast of Madras. The Portuguese eventually retired to Goa, and the Dutch to the Spice Islands. The first English settlement on the east coast was in 1620, at Masulipatam, even then celebrated for its fabrics. Farther south a factory, the nucleus of Madras city, was erected in 1639. Pondicherry was purchased by the French in 1762. For many years the English and French traders lived peacefully side by side, and with no ambition for territorial aggrandizement. The war of the Austrian succession in Europe lit the first flame of hostility on the Coromandel coast. In 1746 Madras was forced to surrender to Labourdonnais, and Fort St. David remained the only British possession in southern India. By the peace of Aix-la-Chapelle Madras was restored to the English; but from this time the rivalry of the two nations was keen, and found its opportunities in the disputed successions which always fill a large place in Oriental politics. English influence was generally able to secure the favor of the rulers of the Carnatic and Tanjore, while the French succeeded in placing their own nominee on the throne at Hyderabad. At last Duplex rose to be the temporary arbiter of the fate of southern India, but he was overthrown by Clive, whose defense of Arcot in 1751 forms the turning point in Indian history. In 1760 the crowning victory of Wandewash was won by Colonel (afterward Sir Eyre) Coote, over Lally, and in the following year, despite help from Mysore, Pondicherry was captured.

Though the English had no longer any European rival, they had yet to deal with Mohammedan fanaticism and the warlike population of the highlands of Mysore. The dynasty founded by Hyder Ali, and terminating in his son Tipu Sultán, proved itself in four several wars, which terminated only in 1799, the most formidable antagonist the English ever had encountered (see HYDER ALI and INDIA). Since the beginning of the present century Madras has known no regular war, but occasional disturbances have called for measures of repression. The *pálegárs* or local chieftains long clung to their independence after their country was ceded to the British. On the west coast, the feudal aristocracy of the Nairs, and the religious fanaticism of the Moplá, have more than once led to rebellion and bloodshed. In the extreme north, the wild tribes occupying the hills of Ganjám and Vizagapatam have only lately learned the habit of subordination. In 1836 the *zamindári* of Gúmsúr in this remote tract was attached by the government for the rebellious conduct of its chief. An inquiry then instituted revealed the wide prevalence among the tribe of Kandhs of human sacrifice, under the name of *meriah*. The practice has since been suppressed by a special agency.

The different territories comprising the Madras presidency have been acquired by the British at various dates. In 1763 the tract encircling Madras city, now Chengalpat district was ceded by the nawáb of Arcot. In 1765 the Northern Circars, out of which the French had recently been driven, were granted to the Company by the Mughal emperor, but at the price of an annual tribute of £90,000. Full rights of dominion were not ac-

quired till 1823, when the tribute was completed for a lump payment. In 1792 Tipu was compelled to cede the Baramahál (now part of Salem district), Malabar, and Dindigal subdivision of Madura. In 1799, on the reconstruction of Mysore state after Tipu's death, Coimbatore and Kánara were appropriated as the British share; and in the same year the Mahratta rájá of Tanjore resigned the administration of his territory, though his descendant retained titular rank till 1855. In 1800 Bellary and Cuddapah were made over by the nizám of Hyderabad to defray the expense of an increased subsidiary force. In the following year the dominions of the nawáb of the Carnatic, extending along the east coast almost continuously from Nellore to Tinneveli, were resigned into the hands of the British by a puppet who had been put upon the throne for the purpose. The last titular nawáb of the Carnatic died in 1855; but his representative still bears the title of prince of Arcot, and is recognized as the first native nobleman in Madras. In 1838 the nawáb of Rarnúl was deposed for misgovernment and suspicion of treason, and his territories annexed.

MADRAS, capital of Madras presidency, is situated on the sea-coast. Although at first sight the city presents a disappointing appearance, and possesses not a single handsome street, it has several edifices of high architectural pretensions, and many spots of historical interest. Seen from the roadstead, the fort, a row of merchants' offices, a few spires and public buildings, are all that strike the eye. Roughly speaking, it consists of the following divisions. (1) Black Town, an ill-built, densely populated block, about a mile square, is the business part of the town, and contains the banks, custom house, high court, and all the mercantile offices. The last, for the most part handsome structures, lie along the beach. On the sea-face of Black Town are the pier and the new harbor. Immediately south of Black Town there is (2) an open space which contains the fort, esplanade, brigade parade ground, government house, and several handsome public buildings on the sea-face. (3) West and south of this lung of the city come a series of crowded quarters known by various native names—Chintadrapet, Tiruvaleswarampet, Pudupák, Royapet, Kistnampet, and Mylapur, which bend to the sea again at the old town of Saint Thomé. (4) To the west of Black Town are the quarters of Veperi and Pudupet, chiefly inhabited by Eurasians, and the suburbs of Egmore, Nangambákam, and Perambúr, adorned with handsome European mansions and their spacious "compounds" or parks. (5) Southwest and south lie the European quarters of Tanampet and aristocratic Adyar. Among the buildings most deserving of notice for their architectural features are the cathedral, Scotch church, government house, Patcheappah's hall, senate house, Chepauk palace (now the Revenue Board), and the Central Railway station.

Nearly all the most important offices of the presidency, and the headquarters of every department, are located in Madras. Apart from the headquarters staff of the Madras army, that of the central division is also stationed here, with a garrison of one European and three native infantry regiments, one battery of artillery, and the bodyguard of the governor (100 sabers). At St. Thomas' Mount are three batteries of artillery and a detachment of native infantry. Including these, the garrison of Madras is about 3,500 strong, of whom 1,200 are Europeans.

The population of Madras city, as ascertained by the census of 1901, was 509,397, including 442,062 Hindus, 50,964 Mohammedans, 12,013 Eurasians, and 3,613 Europeans. The annual municipal income is about £53,000. Madras, notwithstanding its exposed situa-

tion, ranks third among the ports of India in respect of the number and tonnage of vessels calling and the value of its imports and exports. The port trades with every part of the world, exporting coffee, cotton, grain, hides, indigo, oilseeds, dyes, sugar, and horns, and importing piece goods, iron and other metals, and all kinds of European manufactures. The lighthouse, 125 feet high, is visible from a ship's deck fifteen miles at sea. The Madras roadstead, like the whole line of the western coast of India, is liable to be swept by hurricanes of irresistible fury, which occur at irregular intervals of years, generally at the beginning of the monsoons in May and October. The first recorded cyclone was in October, 1746, a few weeks after the fort had surrendered to Labourdonnais. A French fleet then lay at anchor in the roads. Five large ships foundered, with 1,200 men on board; and scarcely a single vessel escaped with its masts standing. Perhaps the most destructive of these storms occurred in May, 1872. On this occasion the registered wind pressure reached a maximum of fifty-three pounds to the square foot. In the space of a few hours nine English vessels and twenty native craft were driven ashore. In May, 1874, another cyclone broke on the Madras coast, but the ships were warned in time to put to sea and gain an offing. The most recent of these periodical hurricanes occurred in November, 1881, when the new harbor works sustained serious damage.

The trade of the town does not depend on any special local manufactures of produce. Such industries as once flourished—weaving, for instance—have decayed, and no others have grown up to replace them. As elsewhere in India, spinning companies have recently been formed, but what effect they are likely to exercise on local trade remains to be seen. With the exception of banks, and enterprises connected with the preparation of produce for export, *e.g.*, cotton-pressing and coffee-cleaning, joint-stock undertakings have not prospered. As the capital of southern India, Madras is the center on which all the great military roads converge. It is also the terminal station of two lines of railway, the Madras line and the Madras and Tanjore section of the South Indian Railway.

The Buckingham Canal, which passes through an outlying part of the city, connects South Arcot district with Nellore and the Krishna and Godáviri system of canal navigation. This long delayed project was undertaken as a famine work.

The town of Madras dates from 1639, when Francis Day, chief of the East India Company's settlement at Armagon, obtained a grant of the present site of the city from the rájá of Chandragiri. A factory, with some slight fortifications, was at once constructed, and a gradually increasing population settled around its walls. In 1653 Madras, which had previously been subordinate to the settlement of Bantam in Java, was raised to the rank of an independent presidency. In 1702 Dáúd Khán, Aurangzeb's general, blockaded the town for a few weeks, and in 1741 the Mahrattas unsuccessfully attacked the place. In 1746 Labourdonnais bombarded and captured the fort. The settlement was restored to the English two years later by the treaty of Aix-la-Chapelle, but the government of the presidency did not return to Madras till 1762. In 1758 the French under Lally occupied the Black Town, and invested the fort. The siege was conducted on both sides with great skill and vigor. After two months, the arrival of a British fleet relieved the garrison, and the besiegers retired with some precipitancy. With the exception of the threatening approach of Hyder Ali's horsemen in 1769, and again in 1780, Madras has since the French siege been free from external attack. The town of

Saint Thomé, now part of Madras city, was founded and fortified by the Portuguese in 1504, and was held by the French from 1672 to 1674.

MADRID, a province of Spain, one of the five into which New Castile is divided, is bounded on the west, northwest, and north by Avila and Segovia, on the east by Guadalajara, on the southeast by Cuenca, and on the south by Toledo. The area is 2,997 square miles, with a population in 1897 of 737,444, an increase of 204,443 since 1860. Madrid belongs to the basin of the Tagus, being separated from that of the Douro by the Sierra Guadarrama, which skirts the province on the northwest and north. The Tagus itself is the southern boundary for some distance, its chief tributary being the Jarama, which rises in the Somosierra in the north, and terminates at Aranjuez. Agriculture is in a somewhat backward condition; the rainfall is deficient, and the rivers, poor though they are, are not utilized as they might be for irrigation. The chief products are wheat, barley, rye, oats, algarrobas (*Ervum tetraspermum*), pease, chick pease, and various other legumes, wine, oil, flax, hemp, wax, honey, and various fruits. The only towns with a population above 10,000 are Alcalá (Complutum) on the Henares, and Madrid; the famous university of the former was transferred to the latter in 1836. Aranjuez (8,154), on the Tagus, is also of historical importance.

MADRID, capital of the above province and of Spain, is situated on the left bank of the Manzanares, a tributary of the Tagus. The population (512,150 in 1897) is now over 550,000. The town is nearly in the center of the kingdom, almost equidistant from the Mediterranean, the Atlantic, and the Bay of Biscay. The site consists of some sandy hills of little elevation, in the midst of an extensive plain, bounded to the view on the north only by the Sierra Guadarrama. The basin in which it stands is of Tertiary formation, consisting of gypsum, marl, and limestone. The form of Madrid proper is almost that of a square with the corners rounded off; from east to west it measures rather less than from north to south. It was formerly surrounded by a poor wall, partly of brick, partly of earth, some twenty feet in height, and pierced by five principal gates (*puertas*) and eleven "portillos." Of these gateways only three, the Puerta de Alcalá on the east, the Puerta de Toledo on the south, and the Portillo de San Vicente on the west, now actually exist; the first and the third were erected in the time of Charles III., and the second in honor of the restoration of Ferdinand VII.: all have some architectural pretensions. The Manzanares (or rather its bed, for the stream is at most seasons of the year quite insignificant) is spanned by six bridges, the Puente de Toledo and that of Segovia being the chief. The Puerta del Sol (formerly the east gate and tower of the city, having on its front a representation of the sun—whence the name) is now the central plaza, and the favorite lounge and place of most traffic in the city; the animated scene it presents has been described with more or less fullness in almost every book of Spanish travel. On its south side stands the Palacio de la Gobernacion, or Home Office, a heavy square building, by a French architect, J. Marquet, and dating from 1768. From the Puerta del Sol diverge, immediately or mediately, almost all the principal streets of Madrid—eastward by north, the Calle de Alcalá, terminating in the Prado; eastward, the Carrera de San Geronimo, terminating by the Plaza de las Cortes also in the Prado; southward, the Calle de Carretas; westward, the Calle Mayor, which leads to the council chamber and to the palace, and the Calle del Arenal, terminating in the Plaza de Isabel II. and the opera house; northwestward, the Calles de Preciados and Del

Carmen; and northward, the Calle de la Montera, which afterward divides into the Calle de Fuencarral to the left and the Calle de Hortaleza to the right. Of these the Calle de Alcalá is the finest; it is bordered on both sides with acacias, and contains some elegant buildings, including the museum of natural history, formerly the general custom-house, dating from 1769, and the offices of the Board of Trade (Ministerio de Hacienda) on the north side, and on the south the palace of the duke of Sesto (the site of which is about to be occupied by the new buildings of the Banco de Espana or Bank of Spain); its irregularity in point of width and level, however, detracts much from its appearance. The Plaza de las Cortes is so called from the Congreso de los Diputados, or House of Commons, on its north side, a building in the Corinthian style, but of little merit; the square contains a bronze statue of Cervantes, by Sola, erected in 1835. The Calle de Carretas ranks with the Carrera de San Geronimo and Calle de la Montera for the excellence of its shops. From the Calle Mayor is entered the Plaza Mayor, a rectangle of about 430 feet by 330, formerly the scene of tournaments, bull fights, autos-de-fe, and similar exhibitions, which used to be viewed by the royal family from the balcony of one of the houses called the Panaderia (belonging to the guild of bakers). The square, which was built under Philip III. in 1619, is surrounded by an arcade; the houses are uniform in height and decoration. In the center stands a bronze equestrian statue of Philip III., designed by Pantoja, cast by Juan de Bologna, and finished by Pedro Tacca. From the southeast angle of the Plaza Mayor the Calle de Atocha, one of the principal thoroughfares of Madrid, leads to the outskirts of the city; at the southwest angle of the same square the Calle de Toledo begins, the chief mart for the various woolen and silken fabrics from which the picturesque costumes peculiar to the peninsula are made. In the Plaza de Isabel II., at the western extremity of the Calle del Arenal, stands the royal opera-house, the principal front of which faces the Plaza del Oriente and the royal palace. In the center of the plaza is a fine bronze equestrian statue of Philip IV.; it was designed by Velazquez and cast by Tacca, while Galileo is said to have suggested the means by which the balance is preserved. The gift of the grand-duke of Tuscany in 1640, it stood in the Buen Retiro gardens until 1844.

As compared with other capitals, Madrid has very few buildings of much interest architecturally or otherwise. There is no cathedral. Of secular buildings unquestionably the most important is the royal palace, (Palacio Real) on the west side of the town, on a rising ground overhanging the Manzanares. It occupies the site of the ancient Moorish alcazar, where a hunting seat was built by Henry IV.; this was enlarged and improved by Charles V. when he first made Madrid his residence in 1532, was further developed by Philip II., but ultimately was destroyed by fire in 1734. The present edifice was begun under Philip V. in 1737 by Sacchetti of Turin, and was finished in 1764. It is in the Tuscan style, and is 470 feet square and 100 feet in height, the material being white Colmenar granite, resembling marble. To the north of the palace are the royal stables and coach-houses, remarkable for their extent; to the south is the armory (Museo de la Real Armeria), containing what is probably the best collection of the kind anywhere to be met with. After the Palacio Real may be mentioned the royal picture gallery (Real Museo de Pinturas), adjoining the Salon del Prado; it was built about 1785 for Charles III. by Juan de Villanueva, as a museum of natural history and academy of sciences. It contains the collections of Charles V., Philip II., and Philip IV., and the pictures

number upward of two thousand. The specimens of Titian, Raphael, Veronese, Tintoretto, Velazquez, Vandyck, Rubens, and Teniers are numerous and remarkable, giving it a claim to be regarded as the finest picture gallery in the world. The palaces of the grandees are noteworthy only for their size. There are some seventeen theaters of all classes. The bull ring, to the east of the town, accommodates 12,000 spectators; the present building dates from 1874. Of the promenades and open places of public resort the most fashionable and most frequented is the Prado (Paseo del Prado, Salon del Prado) on the east side of the town, with its northward continuation the Paseo de Recoletas.

Modern educational movements have not left Madrid unaffected, and considerable improvements in this respect have taken place within recent years. There are upward of 100 official primary schools (attended by 4,810 boys and 3,958 girls), and a large number of private ones; among the other educational instrumentalities the numerous schools connected with various Protestant missions claim special mention. There are two normal schools. The university of Alcalá, founded by Cardinal Ximenes in 1508, was transferred in 1836 to Madrid, and has since that time undergone much reform and extension.

The manufactures of Madrid are inconsiderable; every article of food and clothing, almost without exception, is imported. Madrid is still the principal, one might almost say the only, focus of the now largely developed railway system of the peninsula.

MADRIGAL. See MUSIC.

MADURA, a district in the south of the Madras presidency, India, consists of a section of the plain stretching from the mountains east to the sea, coinciding with the basin of the Vaigái river, and gradually sloping to the southeast. The plain is broken in the west by the outlying spurs of the Gháts, and by a few isolated hills and masses of rock scattered over the country. The census of 1901 showed a total population of 2,266,615 persons (1,112,066 males and 1,154,549 females), spread over an area of 9,502 square miles, and inhabiting 5,459 villages and 443,513 houses. Hindus numbered 2,062,768, and Mohammedans 132,833.

MADURA, the chief town and headquarters of Madura district, is situated on the south bank of the Vaigái river, with a population (1901) of 105,501, being the fourth largest town in the Madras presidency.

MADURA, in High Javanese *Maduntén*, an island of the East Indian Archipelago, separated by the shallow Strait of Madura from the east end of Java. Its area is estimated at 2,100 square miles. As the few travelers who have visited Madura have been for the most part content to follow the highways which, though running the whole length of the island, never strike very far inland from either the north or the south coast, a considerable part of the country is but vaguely known to Europeans. It may be safely asserted, however, that the general configuration is fairly simple,—the island being a plateau-like prolongation of the limestone range of northern Java, with frequent interchange of hill and dale, culminating toward the east in Gunong Pedjudan or Tambuko at a height of 1,542 feet. Hot springs are not infrequent; and in the valley between Gunong Geger and Bandjar lies the mud volcano of Banju Ening. The population of Madura was in 1897 returned as 868,992,—472 Europeans (mostly at Marinagan near Sumenep), 3,702 Chinese, 1,445 Arabs and other Orientals, and 763,373 natives. These last constitute one of the three great races of Java and Madura, and speak a distinct language, for which compare JAVA.

MÆCENAS, C. CILNIUS, is, from two different points of view, a prominent representative man of the ancient world. He was the first, and one of the most capable and successful, of those who filled the office of a great minister under the Roman empire. He was also, if not the first, certainly the most fortunate and influential among the patrons of Roman literature. It is in the latter capacity that he is best known. Among all the names, royal, noble, or otherwise eminent, associated with the patronage of letters, none in either ancient or modern times is so familiarly known as that of Mæcenas. The date and place of his birth are unknown. He first appears in history in the year 40 B.C., when he is employed by Octavianus in arranging his marriage with Scribonia, and afterward in negotiating, along with Pollio and Cocceius Nerva, the peace of Brundisium, and the reconciliation with Antony, which was confirmed by the marriage of the latter with Octavia. Although the place of his birth is unknown, we learn from Horace and Propertius that he prided himself on his ancient Etruscan lineage, and claimed descent from the princely house of the Cilnii, who, as is recorded by Livy, excited the jealousy of their townsmen by their preponderating wealth and influence at Arretium in the fourth century before our era. He probably prized the glories of his paternal and maternal ancestry as compensating him for his original social inferiority to the members of the great Roman houses; and the fact dwelt on so prominently by his panegyrists, that, through all his life, he preferred the position of a great commoner to the new honors of the senate and of the Roman magistracies, may have been the result as much of pride in his provincial ancestry as of a politic desire to disarm the jealousy of his master or of the Roman aristocracy.

His character as a munificent patron of literature is not only acknowledged gratefully by the recipients of it in his own time, but is attested by the regrets of the men of letters of a later age, expressed through the mouths of Martial and Juvenal. His patronage was exercised, not from vanity or a mere dilettante love of letters, but with a view to the higher interest of the state. He recognized in the genius of the poets of that time, not only the truest ornament of the court, but a power of reconciling men's minds to the new order of things, and of investing the actual state of affairs with an ideal glory and majesty.

MAESTRICHT, or MAASTRICHT, the chief town of the province of Limburg, in the Netherlands, lies at the *trecht* or crossing of the Maas (Meuse), where the Romans erected a military post on the road between Bagacum (Bavay) and Colonia Agrippina (Cologne). Aix-la-Chapelle is eighteen miles east-southeast, and Liège eighteen miles south-by-west. The baths discovered in 1840 in the Groote Stokstraat show that the settlement at Trajectum ad Mosam became a place of some considerable importance. The town is divided by the river into two parts—the larger portion, or Maestricht proper, on the left bank, and the smaller portion, distinguished as Wijk, on the right. A stone bridge of eight arches connecting the two took the place of a wooden structure as early as 1280, and was greatly improved in 1828 and 1836. The population, which was 18,000 in the beginning of the century, was 28,917 on January 1, 1882.

MAFFEI, FRANCESCO SCIPIONE, MARCHESE DI, Italian archaeologist and man of letters, was born at Verona, in 1675, and died in 1755.

MAFRA, a town of Portugal, in the province of Estremadura and district of Lisbon, lies near the Atlantic coast, about twenty miles to the northwest of Lisbon, and has a population of 3,231.

MAGDALA (more correctly *Makdala*), a natural stronghold in the country to the south of Abyssinia, situated about 200 miles inland from the Gulf of Aden. The basaltic plateau of which it consists rises 9,110 feet above the level of the sea, and forms along with the neighboring height of Salassye (9,160 feet), with which it is connected by the ridge of Salamgye (8,650 feet), a comparatively small and narrow outrunner of the Amara Seint plateau. It is about three-quarters of a mile in length by less than half a mile in breadth, and lies more than a thousand feet higher than the neighboring plain of Arogye. To the south runs the Kukullo ravine and to the north and the west the Bashilo and the Wark Waha ravines, all of which ultimately drain into the Abai, and thus belong to the basin of the Nile. Chosen by King Theodore of Abyssinia as his principal stronghold in the south, Magdala owes its celebrity to the fact that, as the place of imprisonment of the English captives, it became the goal of the great English expedition of 1868. At the time of its capture it contained huts for a permanent population of about three thousand, a royal residence of the most meager pretensions, a still more insignificant church, and a large treasure-house stored with arms, ecclesiastical furniture, and vast quantities of Abyssinian manuscripts. The whole rock was burned bare by order of Sir Robert Napier, and on the departure of the English it was seized by Mastwat, queen of the Wollo Gallas, in whose country it is situated.

MAGDEBURG, the capital of the Prussian province of Saxony, and one of the strongest fortresses in Germany, situated mainly on the left bank of the Elbe, which here divides into three branches. It consists of the town proper and of the four suburbs of Friedrichstadt, Neustadt, Sudenburg, and Buckau; the last three of these are separated from the town by the ramparts and glacis, but are all included within the new line of advanced bastions. In the Elbe, between the old town and the Friedrichstadt, lies an island called the Werder, occupied by the citadel, and united with both banks by bridges. With the exception of the Breiter Weg, a handsome thoroughfare running from north to south, the streets of the town proper are narrow and crooked. Along the Elbe, however, extends a fine promenade named the Fürstenwall, at one end of which stands a monument in commemoration of the Franco-German war. To the south of the inner town is the Friedrich-Wilhelm's Garten, a beautiful park laid out on the site of the celebrated convent of Bergen, which was founded in 937 and suppressed in 1810. By far the most important building in Magdeburg is the cathedral, a handsome and massive structure of the thirteenth and fourteenth centuries. The favorable situation of Magdeburg, in the very heart of Germany, and on the Elbe below all its principal affluents, has made it one of the most important commercial towns in the empire, and it is also the focus of several important railways. The chief articles of commerce are agricultural and colonial products, manufactured goods, and wine. The population of Magdeburg in 1901 was 229,663, or, including Neustadt and Buckau, 237,109.

During the Thirty Years' War the city was twice besieged, and suffered terribly. It successfully resisted Wallenstein for seven months in 1629, but was stormed and sacked by Tilly in 1631. The whole town, with the exception of the cathedral, the Frauenkirche, and about 140 houses, was burned to the ground, and 30,000 of its 36,000 inhabitants were butchered without regard to age or sex. The town recovered from this deadly blow with wonderful rapidity.

MAGELLAN, FERDINAND, in Portuguese FERNÃO DE MAGALHÃES who, though he did not survive to

return home with his ship, well deserves the title of the "first circumnavigator," was born about 1470, and (according to the somewhat questionable authority of his will, dating from 1504) at Villa de Sabroza in the district of Villa Real, Traz os Montes. His family was "hidalgo," and he seems to have spent his boyhood in the household of Queen Leonora, consort of John II. of Portugal. For several years he was in active service in the East Indies. On August 10, 1519, his expedition set sail; to find his way by a western route to the Spice Islands of the East was the task which its commander had undertaken. When more than three years afterward, on September 6, 1522, the *Victoria* cast anchor in a Spanish port, the captain, Sebastian del Cano, had a strange tale to tell of mingled triumph and tragedy. While the squadron lay in Port St. Julian, on the Patagonian coast, three of Magellan's Spanish captains had defied him and conspired against him, and it was only by a rapid execution of summary vengeance that he had maintained his authority. At a later date the *Antonio* at the instigation of Gomez, the Portuguese pilot, his personal enemy, sailed home to Spain with evil reports, at the very moment of success, when the Strait of the Eleven Thousand Virgins, or of the Patagonians, now known as the Strait of Magellan, had been explored almost to the Pacific. The strait was passed on November 28, 1520; and, though Magellan had not quite reached the Spice Islands when he fell in conflict with the people of Zebu, April 27, 1521, his task was virtually accomplished. The name of Magellan's Land—long given to Patagonia and that hypothetical continent of which Tierra del Fuego was considered only a portion—had disappeared from our maps, but has again been bestowed by Chili on the territory she claims in the extreme south.

MAGGIORE, LAGO (French, *Lac Majeur*; in Italian also frequently *Lago Verbano*; Latin, *Verbanus*), is the westmost of the great lakes of northern Italy. In accordance with its popular name it has long been reputed the largest of them all; but though in length it somewhat surpasses Lago di Garda, it does not cover so extensive an area. Of the total surface of eighty-two miles, sixty-five belong to Italy, and the remaining seventeen to the Swiss canton of Tessin or Ticino. The length from north to south is thirty-eight miles; the breadth, generally between two and four miles, is increased to six or seven at the junction of the Toce valley on the west. The Ticino, the leading tributary of the Po, enters at the one end of the lake and escapes at the other. On Dufour's great map of Switzerland the greatest depth is given as 2,801 feet, opposite Pino; but this is probably much in excess, as in G. B. Maggi's topographical map of the lake (Turin, 1857) the highest figure registered along the medial line is only 1,233 feet between Barbe and Lavello, and at the laying of a telegraph line in 1860 Salis found no more than 337 between Vira and Locarno. The ordinary height of the surface above the sea is about 640 feet. Between the lowest and highest water-mark, however, there is a difference in ordinary years of nearly twelve feet, and in very exceptional cases of twice as much. For not only is the Ticino subject to floods, but the lake receives a number of considerable streams, and some of these bring down the surplus waters of other lakes—Lugano, Varese, and Orta. The flood of 1868, which exceeded by about six feet the greatest that had been known for centuries, so deepened and enlarged the outlet of the river that the level of the lake was permanently reduced by about a foot and a half, and alterations had to be made at the various ports to suit the new condition of things.

The principal towns and villages round the lake are

the following—the first being in Switzerland, and the others in Italy: Locarno (population in 1890, 2,645), at the mouth of the Maggia, one of the alternate capitals of the canton of Ticino; Cannobio (2,000), famous from the fifteenth century for its tanneries, and with paper-mills and silk-works; Luino (2,000), the original home of the Luini family, and the scene of one of Garibaldi's exploits in 1867, commemorated on the spot by a statue of the victor; Laveno (1,500), formerly an Austrian naval harbor; Intra (4,500), a busy manufacturing town—cotton, glass, silk, etc.; and Pallanza (4,200), a flourishing little city with a large cathedral, a penitentiary, etc., and altogether the most important place on the lake.

MAGHIANA, the chief town and headquarters of Jhang district, Punjab, India, has a population of 10,525 (Hindus, 5,192; Mohammedans, 4,698; Sikhs, 306; and "others," 329). The united population is 19,649.

MAGIC has its name from the *magi*, the hereditary caste of priests among the ancient Persians, thought to be of Median origin. Among the magi the interpretation of dreams was practiced, as appears from the story of the birth of Cyrus; later writers describe them in both a sacerdotal and magical capacity, Lucian calling them a prophetic class and devoted to the gods, while Cicero writes of them as wise men, augurs and diviners. In such supernatural crafts the magi seem to have much influenced the Western nations, to judge by their name being passed into a set of classical terms applied to sorcery, enchantment and occult science in general. In the New Testament soothsaying and sorcery are so designated; while the astrologers who divine the birth of the King of the Jews by the appearance of a star in the east are called magi.

The word magic is still used, as in the ancient world, to include a confused mass of beliefs and practices, hardly agreeing except in being beyond those ordinary actions of cause and effect which men accustomed to their regularity have come to regard as merely natural.

It must be noticed, that many magical arts show no connection with spirits at all, or, even if ghosts or demons or gods have to do with them, the nature of these beings does not of itself account for the processes employed or the effects believed to result. This non-spiritual element in magic depends on imagined powers and correspondences in nature, of which the adepts avail themselves in order to discover hidden knowledge, and to act on the world around them by means beyond the ordinary capabilities of men. The great characteristic of magic is its unreality. Its methods have often an ideal coherence which may be plainly traced, but practical effect they have none, and so they may be altered or transposed without being made worse or better. One remarkable consequence of this is the fixity with which some magical formulas framed thousands of years ago hold on almost unchanged to this day. To understand this, it must be borne in mind that, if there were any practical use in such rules as those for divining by the cries of animals, the old rules would have been improved by experience into new shapes. But, they being worthless and incapable of improvement, this motive of change is absent, and the old precepts have held their ground, handed on by faithful but stupid tradition, from age to age. When the test of practical efficacy comes in upon the magic art, it is apt either to destroy it utterly or to transform it into something more rational, which passes from supernatural into natural science.

Magic is to be reckoned among the earliest growths of human thought. The evidence for its remote antiquity lies partly in its presence among all races of mankind, the ruder tribes especially showing it in such

intelligible shapes that the beginnings of magical crafts may be fairly supposed to have arisen in the oldest and lowest periods of culture. An example may be taken from the wild natives of Australia, whose whole life is pervaded by the belief, and embittered by the terror, of sorcery. The Australians, like other low tribes in the world whose minds are thus set on imaginary causes of death, hardly believe a man can die unless by being slain or bewitched. When a native dies what we call a natural death, they ascribe it to magic. Not disease and cure only, but other events of life, come within the scope of native magic. Storm and thunder are the work of the sorcerers; they can bring rain and make the rivers swell, or burn up the land with drought. Shooting stars and comets are to the natives omens of disaster; the great hawk's cry in the night portends the death of a child, whose soul the bird is carrying off; but when a man's finger-joints crack he stretches out his arm, for in that direction some one is doing him a kindness.

In the Pacific islands the Europeans found a whole class of sorcerers living by making diseases, their method being the familiar one of burning or otherwise practicing on some morsel of hair or remnant of food, so as to send disease into its owner, by a malignant spirit tying knots in his inside till he writhed with agony. Every sick man was a source of profit to the sorcerer who was believed to have brought on the disease by burning his rubbish, and of course had to be bought off by liberal presents. In these Pacific islands a fact most important in the theory of magic everywhere comes into view with particular distinctness—that such magical arts prove effective through the patient's own imagination; when he knows or fancies that he has been bewitched he will fall ill, and he will actually die unless he can be persuaded that he has been cured. Thus, wherever sorcery is practiced with the belief of its victims, some system of exorcism or some protective magical art becomes, not only necessary, but actually effective, a mental disease being met by a mental remedy to match it. At the discovery of America the Spaniards found the native sorcerers throwing themselves into delirious ecstasy by snuffing a narcotic powder, their ravings in this state being held to be conversation with departed souls, through whose help they were able to cure the sick by expelling the disease. The class to which these sorcerers belong extends over South America, and is generally known under the name of *payé* (or allied terms). The sorcerer is described as being initiated by living in some wild spot till by fasting and self-torture he attains his supernatural craft, becoming able to see spirits, to consecrate bits of bone or stone into powerful amulets, to make good or bad weather, to gain mystic powers over familiar birds and beasts, to take omens from their cries or from the itching of his own skin, which latter symptom an Abipone diviner declared to portend an attack from a tribe of enemies, in spite of the missionary, who irreverently set it down to fleas.

In North America practitioners of the same kind are generally known as "medicine-men," from the French colonists calling them *médecins*, as being the native doctors; the term is really appropriate to barbaric magicians in all parts of the world, whose arts of causing and curing disease generally include considerable knowledge of herbs powerful as poisons and remedies, of simple stopping of wounds and bandaging hurt limbs, in fact of medicine in its elementary state, as yet not separated from the magic with which it was at first inextricably mixed up. The medicine-man's apparatus includes the sorcerer's usual music, the rattle and the drum, simple and primitive instruments whose constant association with the lower magic bears witness to the beginning

music and magic having been associated together when civilization was yet in its low stages of development. The American sorcerer carries a "medicine-bag" made with the skin of his guardian animal, which protects him in fight, cures the bites of serpents, and strikes at a distance as a spiritual weapon. He knows magic chants of power over the elements; he can by sucking and blowing extract disease-animals from the sick; he can make pictures and images and pierce them with thorns so as to kill the men or animals they represent; and he can compel love by practicing on the heart of the picture of the beloved one. In Africa the native sorcerer bears the name of *mganga* among the west and central negro tribes, *nyanya* among the Zulus of the south. He is the rain-maker, an office of the utmost importance among tribes who may perish of famine and disease after a long drought. In his craft a principal part is played by what the English in Africa (using the Portuguese word *feitico*, charm or amulet) call "fetiches," which are claws, fangs, roots, stones, and any other odds and ends fancied to be inhabited by spirits or invested with superhuman power. These fetiches the negroes trust in for good and against evil fortune, with a confidence which no failure can shake further than to cause the unlucky bearer to discard a particular fetich which has failed, and to replace it by a more successful one.

MAGIC, WHITE. Under this head is included the art of performing tricks and exhibiting illusions by aid of apparatus, excluding feats of dexterity in which there is no deception, together with the performances of such automaton figures as are actuated in a secret and mysterious manner. Conjuring by prestidigitation, or sleight of hand, independently of mechanical apparatus, is referred to under **LEGERDEMAIN**.

The Egyptian hierophants, as well as the magicians of ancient Greece and Rome, were accustomed to astonish their dupes with optical illusions, visible representations of the divinities and subdivinities passing before the spectators in dark subterranean chambers. From the descriptions of ancient authors we may conjecture that the principal optical illusion employed in these effects was the throwing of spectral images of living persons and other objects upon the smoke of burning incense by means of concave metal mirrors. The flashes of lightning and the rolling thunders which sometimes accompanied these manifestations were easy tricks, now familiar to everybody as the ignition of lycopodium and the shaking of a sheet of metal. The ancient methods described by Hippolytus (iv. 32) were very similar.

Spectral pictures or reflections of moving objects, similar to those of the camera or magic lantern, were described in the fourteenth and sixteenth centuries, and Roger Bacon, in his *Discovery of the Miracles of Art, Nature, and Magic* (about 1260), writes of glass lenses and perspectives so well made as to give good telescopic and microscopic effects, and to be useful to old men and those who have weak eyes. Toward the end of last century Comus, a French conjurer (the second of the name), included in his entertainment a figure which suddenly appeared and disappeared about three feet above a table—a trick explained by the circumstance that a concave mirror was among his properties; and a contemporary performer, Robert, exhibited the raising of the dead by the same agency. Early in the present century Philipstal gave a sensation to his magic lantern entertainment by lowering unperceived between the audience and the stage a sheet of gauze upon which fell the vivid moving shadows of phantasmagoria.

A new era in optical tricks began in 1863, when John Nevil Maskelyne invented a wood cabinet, in which persons vanished and were made to reappear, although it was placed upon high feet, with no passage through

which a person could pass from the cabinet to the stage floor, the scenes, or the ceiling; and this cabinet was examined and measured for concealed space, and watched round by persons from the audience during the whole of the transformations. The general principle undoubtedly was this:—if a looking-glass be set upright in the corner of a room, bisecting the right angle formed by the walls, the side wall reflected will appear as if it were the back, and hence an object may be hidden behind the glass, yet the space seems to remain unoccupied. This principle, however, was so carried out that no sign of the existence of any mirror was discernible under the closest inspection. Two years later the same principle appeared in "The Cabinet of Proteus," patented by Tobin and Pepper of the Polytechnic Institution, in which two mirrors were employed, meeting in the middle, where an upright pillar concealed their edges. In the same year Stodare exhibited the illusion in an extended form, by placing the pair of mirrors in the center of the stage, supported between the legs of a three-legged table having the apex toward the audience; and as the side walls of his stage were draped exactly like the back, reflection showed an apparently clear space below the table top, where in reality a man in a sitting position was hidden behind the glasses, and exhibited his head ("The Sphinx") above the table. The plane mirror illusion is so effective that it has been reproduced with modifications by various performers. Maskelyne improved upon his original cabinet by taking out a shelf which, in conjunction with a mirror, could inclose a space, and thus left no apparent place in which a person could possibly be hidden. He introduced a further mystification by secretly conveying a person behind a curtain screen, notwithstanding that, during the whole time, the existence of a clear space under the stool upon which the screen is placed is proved by performers continually walking round. And the illusion reached its height when he revealed or "vanished" a succession of persons out of a light shell obelisk or "Cleopatra's Needle," with a sheet of paper interposed between this cover and the stool it stood upon, thus intercepting the apparently only available avenue of approach. The principle of reflecting by means of transparent plate glass the images of highly illuminated objects placed in front, so that they appear as if among less brilliantly lighted objects behind the glass, was employed in the "ghost" illusions of Sylvester, of Dircks and Pepper, of Robin, and of some other inventors—the transparent plate glass being, in some cases, inclined forward so as to reflect a lime-lighted object placed below the front of the stage, and in other arrangements set vertically at an angle so as to reflect the object from a lateral position.

Among the acoustic wonders of antiquities, fabled or real, were the speaking head of Orpheus, the golden virgins, whose voices resounded through the temple of Delphi, and the like. Hippolytus (iv. 4) explains the trick of the speaking head as practiced in his day: the voice was really that of a concealed assistant who spoke through the flexible gullet of a crane. Toward the close of the tenth century Gerbert (Pope Sylvester II.) constructed (says William of Malmesbury) a brazen head which answered questions; and similar inventions are ascribed to Roger Bacon, Albertus Magnus, and others. In the latter part of the seventeenth century Thomas Irson, an Englishman, exhibited at the court of Charles II. a wooden figure with a speaking-trumpet in its mouth; and questions whispered in its ear were answered through a pipe secretly communicating with an apartment wherein was a learned priest able to converse in various languages. Beckmann, in his *History of Inventions* (about 1770), relates his inspection of a speaking

figure, in which the words really came through a tube from a confederate who held a card of signs by which he received intelligence from the exhibitor. In 1783 Giuseppe Pinetti de Wildalle, an Italian conjuror of great originality, exhibited among his many wonders a toy bird perched upon a bottle, which fluttered, blew out a candle, and warbled any melody proposed or improvised by the audience—doing this also when removed from the bottle to a table, or when held in the performer's hand upon any part of the stage. The sounds were produced by a confederate who imitated song-birds after Rossignol's method by aid of the inner skin of an onion in the mouth; and speaking-trumpets directed the sounds to whatever position was occupied by the bird. About the year 1825 Charles, a Frenchman, exhibited a copper globe, carrying four speaking-trumpets, which was suspended in a light frame in the center of a room. Whispers uttered near to this apparatus were heard by a confederate in an adjoining room by means of a tube passing through the frame and the floor, and answers issued from the trumpets in a loud tone. And of late years have appeared more than one illusion of a similar order, in which the talking and singing of a distant person issue from an isolated head or figure by aid of ear-trumpets secretly contained within parts in which, from their outside form, the presence of such instruments would not be suspected. It is probable that the automaton trumpets of Kaufmann and of Maelzel were clever deceptions of the same kind.

Lucian tells of the magician Alexander in the second century that he received written questions inclosed in sealed envelopes, and a few days afterward delivered written responses in the same envelopes, with the seals apparently unbroken; and both he and Hippolitus explain several methods by which this could be effected. In this deception we have the germ of "spirit reading" and "spirit writing," which, introduced in 1840 by Anderson, "The Wizard of the North," became common in the *répertoire* of modern conjurers—embracing a variety of effects from an instantaneous substitution which allows the performer or his confederate to see what has been secretly written by the audience. The so-called "second-sight" trick depends upon a system of signaling between the exhibitor, who moves among the audience collecting questions to be answered and articles to be described, and the performer, who is blindfolded on the stage.

Fire tricks, such as walking on burning coals, breathing flame and smoke from a gall-nut filled with an inflammable composition and wrapped in tow, or dipping the hands in boiling pitch, were known in early times, and are explained by Hippolytus (iv. 33.) At the close of the seventeenth century Richardson astonished the English public by chewing ignited coals, pouring melted lead (really quicksilver) upon his tongue, and swallowing melted glass. Strutt, in *Sports and Pastimes of the People of England*, relates how he saw Powel the fire-eater, in 1762, broil a piece of beefsteak laid upon his tongue, a piece of lighted charcoal being placed under his tongue which a spectator blew upon with a bellows till the meat was sufficiently done. This man also drank a melted mixture of pitch, brimstone, and lead out of an iron spoon, the stuff blazing furiously. These performers anointed their mouths and tongues with a protective composition.

Galen speaks of a person in the second century who relighted a blown-out candle by holding it against a wall or a stone which had been rubbed with sulphur and naphtha; and the instantaneous lighting of candles became a famous feat of later times. In 1842 Louis Döbler, a German conjuror of much originality, surprised his audience by lighting 200 candles instantane-

ously upon the firing of a pistol. This was the earliest application of electricity to stage illusions. The candles were so arranged that each wick, black from previous burning, stood a few inches in front of a fine nozzle gas-burner projecting horizontally from a pipe of hydrogen gas, and the 200 jets of gas passed through the same number of gaps in a conducting-wire. An electric current leaping in a spark through each jet of gas ignited all simultaneously, and the gas flames fired the candle wicks.

Robert-Houdin, who opened his "Temple of Magic" at Paris in 1845, originated the application of electromagnetism for secretly working or controlling mechanical apparatus in stage illusions. He first exhibited in 1845 his light and heavy chest, which, when placed upon the broad plank or "rake" among the spectators, and exactly over a powerful electromagnet hidden under the cloth covering of the plank, was held fast at pleasure. In order to divert suspicion Houdin showed a second experiment with the same box, suspending it by a rope which passed over a single small pulley attached to the ceiling; but any person in the audience who took hold of the rope to feel the sudden increase in the weight of the box was unaware that the rope, while appearing to pass simply over the pulley, really passed upward over a winding-barrel worked as required by an assistant. Remarkable ingenuity was displayed in concealing a small electromagnet in the handle of his glass bell, as well as in his drum, the electric current passing through wires hidden within the cord by which these articles were suspended. In one of Houdin's illusions—throwing eight half-crowns into a crystal cash-box previously set swinging—electricity was employed in a different manner. Top, bottom, sides, and ends of an oblong casket were of transparent glass, held together at all the edges by a light metal frame. The coins were concealed under an opaque design on the lid, and supported by a false lid of glass, which was tied by cotton thread to a piece of platinum wire. Upon connecting the electric circuit, the platinum, becoming red-hot, severed the thread, letting fall the glass flap, and dropping the coins into the box.

Down to the latter part of last century no means of secretly communicating *ad libitum* motions to apparently isolated pieces of mechanism had superseded the clumsy device of packing a confederate into a box on legs draped to look like an unsophisticated table. Pinetti placed three horizontal levers close beside each other in the top of a thin table, covered by a cloth, these levers being actuated by wires passing through the legs and feet of the table and to the confederate behind a scene or partition. In the pedestal of each piece of apparatus which was to be operated upon when set loosely upon the table were three corresponding levers hidden by cloth; and, after being examined by the audience, the piece of mechanism was placed upon a table in such a position that the two sets of levers exactly coincided, one being superimposed upon the other. In one "effect" the confederate worked a small bellows in the base of a lamp, to blow out the flame; in another he let go a trigger, causing an arrow to fly by a spring from the bow of a doll sportsman; he actuated a double bellows inside a bottle, which caused flowers and fruit to protrude from among the foliage of an artificial shrub, by distending with air a number of small bladders shaped and painted to represent them; he opened or shut valves which allowed balls to issue out of various doors in a model house as directed by the audience; and he moved the tiny bellows in the body of a toy bird by which it blew out a candle. Other conjurers added more complicated pieces of apparatus—one being a clock with small hand moving upon a glass disk as required by the audience.

It is remarkable how many of the illusions regarded as the original inventions of eminent conjurers have been really improvements of older tricks. *Hocus Pocus Junior, The Anatomy of Legerdemain* (4th edition, 1654), gives an explanatory cut of a method of drawing different liquors out of a single tap in a barrel, the barrel being divided into compartments, each having an air-hole at the top, by means of which the liquid in any of the compartments was withheld or permitted to flow. Robert-Houdin applied the principle to a wine-bottle held in his hand from which he could pour four different liquids regulated by the unstopping of any of the four tiny air holes which were covered by his fingers. A large number of very small liqueur glasses being provided on trays, and containing drops of certain flavoring essences, enabled him to supply imitations of various wines and liquors, according to the glasses into which he poured syrup from the bottle; while by a skillful substitution of a full bottle for an emptied one, or by secretly refilling in the act of wiping the bottle with a cloth, he produced the impression that the bottle was "inexhaustible." In 1835 was first exhibited in England a trick which a Brahman had been seen to perform at Madras several years before. Ching Lau Lauro sat cross-legged upon nothing—one of his hands only just touching some beads hung upon a genuine hollow bamboo which was set upright in a hole on the top of a wooden stool. The placing of the performer in position was done behind a screen; and the explanation of the mysterious suspension is that he passed through the bamboo a strong iron bar, to which he connected a support which, concealed by the beads, his hand, and his dress, upheld his body. In 1849 Robert-Houdin reproduced the idea under the title of ethereal suspension—professedly rendering his son's body devoid of weight by administering vapor of ether to his nose, and then, in sight of the audience, laying him in a horizontal position in the air with one elbow resting upon a staff resembling a long walking stick. The support was a jointed iron frame under the boy's dress, with cushions and belts passing round and under the body. Subsequently the trick was improved upon by Sylvester—the suspended person being shown in several changes of position, while the sole supporting upright was finally removed. For the latter deception the steel upright was made with polished angular faces, apex toward the spectators, and acted in a dim light on the same principle as the mirrors of a Sphinx table. Before lowering the light, the reflector bar is covered by the wood staff set up before it.

The mysterious vanishing or appearing of a person under a large extinguisher upon the top of a table, and without the use of mirrors, was first performed by Comus, a French conjurer very expert in the cups-and-balls slight-of-hand, who, appearing in London in 1789, announced that he would convey his wife under a cup in the same manner as he would the balls. The feat was accomplished by means of a trap in a box table. Early in the present century Chalons, a Swiss conjuror, transformed a bird into a young lady, on the same principle. In 1836 Sutton varied the feat by causing the vanished body to reappear under the crust of a great pie. Houdin "vanished" a person standing upon a table top which was shown to be only a few inches thick; but there was a false top which was let down like the side of a bellows, this distension being hidden by a tablecloth hanging sufficiently low for the purpose, and the person, when covered by the extinguisher, entered the table through a trap-door opening upward. Robin, in 1851, added to the wonder of the trick by vanishing two persons in succession, without any possibility of either escaping from the table—the two persons really

packing themselves into a space which, without clever arrangement and practice, could not hold more than one. The sword-and-basket trick was common in India many years ago. In one form it consisted in inverting an empty basket over a child upon the ground; after the child had secreted himself between the basket-bottom and a belt concealed by a curtain painted to look like the actual wicker bottom, a sword was thrust through both sides of the basket, the child screaming, and squeezing upon the sword and upon the ground a blood-colored liquid from a sponge. When the performer upset the basket, the child could not be seen; but another child similarly costumed suddenly appeared among the spectators, having been up to that time supported by a pair of stirrups under the cloak of a confederate among the bystanders. In another form an oblong basket is used large at the bottom and tapering to the top, with the lid occupying only the central portion of the top, and the child is so disposed round the basket that the sword plunged downward avoids him, and the performer can step inside and stamp upon the bottom to prove that the basket is empty. In 1865 Stodard introduced the trick into England, but in a new manner. Upon light tressels he placed a large oblong basket; and after a lady attired in a profuse muslin dress had composed herself and her abundance of skirt within, after the lid had been shut and the sword plunged through the sides, the basket was tilted toward the audience to show that it was empty, and the lady reappeared in a gallery of the hall. The basket was formed with an outer shell to turn down, leaving the lady with her dress packed together lying upon the basket bottom and behind what had formed a false front side—the principle being the same as in the clown's box, which, when containing a man, is rolled over to display the inside empty. The reappearing lady was a double, or twin sister.

Among the most meritorious and celebrated mechanical illusions have been automaton figures secretly influenced in their movements by concealed operators. In the seventeenth century M. Raisin, organist of Troyes, took to the French court a harpsichord which played airs as directed by the audience; but, upon opening the instrument, Louis XIV. discovered a youthful performer inside. In 1769 Baron Kempelen, of Pressburg, in Hungary, completed his chess-player, which for a long time remained the puzzle of Europe. It was an illusion—the merit consisting in the devices by which the confederate player was hidden in the cabinet and body of the figure, while the interior was opened in successive installments to the scrutiny of the spectators. The first player was a Polish patriot, Worosky, who had lost both legs in a campaign; as he was furnished with artificial limbs when in public, his appearance, together with the fact that no dwarf or child traveled in Kempelen's company, dispelled the suspicion that any person could be employed inside the machine. This automaton, which made more than one tour to the capitals and courts of Europe, and was owned for a short time by Napoleon I., was exhibited by Maelzel after the death of Kempelen in 1819, and ultimately perished in a fire at Philadelphia in 1854. A revival of the trick appeared in Hooper's "Ajeeb," shown a few years ago at the Sydenham Crystal Palace and elsewhere. Still more recently a chess-playing figure, "Mephisto," designed by Gumpel, has been on view. No space exists for the accommodation of a living player within; but, as there is no attempt at isolating the apparatus from mechanical communication through the carpet or the floor, there is nothing to preclude the moving arm and gripping finger and thumb of the figure from being worked by any convenient connection of

threads, wires, rods, and levers. In 1875 Maskelyne and Cooke produced at the Egyptian Hall, in London, an automaton whist-player, "Psycho," which, from the manner in which it is placed upon the stage, appears to be perfectly isolated from any mechanical communication from without; there is no room within for the concealment of a living player by aid of any optical or other illusion, and yet the free motions of both arms, especially of the right arm and hand in finding any card, taking hold of it, and raising it or lowering it to any position and at any speed as demanded by the audience, prove that the actions are directed from without. The arm has all the complicated movements necessary for chess or draught playing; and Psycho calculates any sum up to a total of 99,000,000. What the mysterious means of connection are has not been discovered; or, at any rate, down to the time of writing this article there has appeared no correct imitation of this joint invention of John Nevil Maskelyne and John Algernon Clarke. Perhaps a still more original automaton is Maskelyne's figure "Zoe," constructed in 1877, which writes and draws at dictation of the audience, yet cannot have a living person within, and could not be more completely severed from all conceivable means of control without. "Zoe," a nearly life-size but very light doll, sits loose upon a cushioned skeleton-stand, of which the solid feet of the plinth rest upon a thick plate of clear glass laid upon the floor-cloth or carpet of the stage. "Psycho," a smaller Oriental figure, sitting cross-legged on a box, is supported by a single large cylinder of clear glass, which, as originally exhibited, stood upon the carpet of the stage, but was afterward set loose on a small stool, having solid wood feet; moreover, this automaton may be placed in almost any number of different ways. Thus, from the precautions observed in the isolation of Maskelyne's automata, no current of electricity, no magnetic attraction, no hydraulic or pneumatic force can reach them, or, if it could, would not account for the many and delicate movements which they execute; and there can be no wires, threads, or hairs passing in any direction away from the figures, seeing that persons from the audience admitted close around the figures while they are in operation could not fail to observe them. It may be mentioned that, in the same year in which "Psycho" appeared, the joint inventors patented a method of controlling the speed of clock-work mechanism by compressed air or gas stored in the pedestal of an automaton, this compressed fluid acting upon a piston in a cylinder, and also upon a rotating fan when a valve is opened by "an electrical or other connection worked by the foot of the performer or an assistant." But it is not known whether the principle obscurely described in the specification was applicable in any way to the invisible agency employed in "Psycho" or in "Zoe," or whether it had reference to some other invention which has never been realized.

Oriental ingenuity, which furnished the original idea of the ethereal suspension trick, contributed the Chinese rings introduced into England in 1834; also the Chinese feat of producing a bowl of water with gold-fish out of a shawl, first seen in England in 1845, and the Indian rope-tying and sack feats upon which the American brothers Davenport founded a distinct order of performances in 1859. Their quick escape from rope bonds in which they were tied by representatives of the audience, the instantaneous removal of their coats in a dark séance, leaving themselves still bound, and their various other so-called "phenomena" were exposed and imitated.

MAGIC LANTERN is the name given to an optical

instrument for projecting on a white wall or screen largely magnified representations of transparent pictures painted or photographed on glass. The invention of the magic lantern is usually attributed to Athanasius Kircher, who died in 1680, although, according to some, it was known four centuries earlier to Roger Bacon. For long after its discovery the magic lantern was used chiefly to exhibit comic pictures, or in the hands of so-called wizards to summon up ghosts and perform other tricks astonishing to those who were ignorant of the simple optical principles employed. Within the last twenty or thirty years, however, and mainly on account of the invention of photography, the magic lantern has been greatly improved in construction, and its use widely extended. By its means finely executed photographs on glass can be shown greatly magnified to large audiences. The scientific lecturer is thus saved the trouble and expense of preparing large diagrams, besides having his subject better illustrated. When suitably constructed, the magic lantern can be used in the form of a microscope to exhibit on a screen the forms and movements of minute living organisms, or to show to an audience delicate physical and chemical experiments which could otherwise be seen only by a few at a time.

MAGIC SQUARE. A magic square is one divided into any number of equal squares, like a chess-board, in each of which is placed one of a series of consecutive numbers from one up to the square of the number of cells in a side, in such a manner that the sum of those in the same row or column and in each of the two diagonals is constant.

From a very early period these squares engaged the attention of mathematicians, especially such as possessed a love of the marvelous, or sought to win for themselves a superstitious regard. They were then supposed to possess magical properties, and were worn, as in India at the present day, engraven in metal or stone, as amulets or talismans. According to the mystic imaginings of the old astrologers relations subsisted between these squares and the planets: a square with only one cell, containing 1, symbolized the unity of the deity; a square of 2, containing the four elements, was the symbol of matter; while those of 3, 4, 5, 6, 7, 8 were consecrated respectively to Saturn, Jupiter, Mars, the Sun, Venus, and Mercury. In later times such squares ranked only as mathematical curiosities; till at last their mode of construction was systematically investigated. These squares were at first mere triumphs of the same dogged perseverance as was in later times exhibited by the Dutchman, Ludolph van Ceulen, who after calculating π to thirty-five places of decimals, directed, like Archimedes, that it should be engraven on his tomb, though his industry was surpassed by M. de Lagry, who continued the decimal to 127 places. The earliest known writer on the subject was Emanuel Moscopulus, a Greek, who lived in the fourth or fifth century, and whose manuscript is preserved in the National Library at Paris. After him Frenicle constructed magic squares, such that if one or more of the encircling bands of numbers be taken away the remaining central squares are still magical. Subsequently M. Poignard constructed squares with numbers in arithmetical progression, having the magical summations. The later researches of M. de la Hire, recorded in the *Mémoires de l'Académie Royale* in 1705, are interesting as giving general methods of construction. He has there collected the results of the labors of earlier pioneers; but the subject has now been fully systematized, and extended to cubes.

MAGIE, DAVID, clergyman and writer; born in Elizabeth, N. J., March 13, 1795; died there May 10, 1865. He graduated at Princeton in 1817, and from 1821 till his death was pastor of a Presbyterian church at Elizabeth. In 1842 he was made D.D. at Amherst. He wrote *The Springtime of Life* (1855), and a tract entitled *The Citizen Soldier*, of which 250,000 copies were distributed during the Civil War.

MAGILL, MARY TUCKER, writer; born in Jefferson Co., Va., Aug. 21, 1832. After the Civil War she aided her mother in establishing a boarding-school at Winchester, Va. She has written *The Holcombes*, a story of Virginia home life (1868); *Women; or, Chronicles of the Late War* (1870); a *School History of Virginia* (1877); and *Pantomimes; or, Wordless Poems* (1882).

MAGILP, or MEGILP, a preparation of linseed-oil and mastic varnish, used by oil-painters as a medium and for glazes. Robertson's medium, which is similar but dries more quickly, is now often preferred.

MAGIONE, a town in Perugia province, Italy, 9 miles W.N.W. of Perugia. Population 6,851.

MAGISTRATE. The term magistrate, derived from the Latin *magistratus*, is one of more general and comprehensive meaning than JUSTICE OF THE PEACE, which has already been treated of, and is of far higher antiquity. Speaking generally, a magistrate is a public civil officer invested with legal or other authority; but the term is more particularly applied to subordinate officers, as justices of the peace and the like, deriving their authority solely from the chief of the state or in virtue of legislative enactment. During the Roman republic the offices of magistrate and judge were distinct and separate. A magistrate was appointed *cum jurisdictione et imperio*; to a judge belonged only *nuda notio sine jurisdictione et imperio*. The office of the magistrate was to inquire into matters of law; and whatever business was transacted before him was said to be done *in jure*. The office of the judge was to inquire into matters of fact; and whatever was transacted before him was said to be done *in judicio*. When the magistrate took cognizance of both the law and the fact he was said to administer justice *extra ordinem*; and the judgment so administered was called extraordinary. The magistrate, when he decided on matters of law, was assisted by a council of ten, called *decemviri litibus judicandis*. To these was added in important cases another council of one hundred and five persons, selected from each tribe, whose judgment was final; this was called *judicium centumvirale*. After the decline of the Roman republic the offices of magistrate and judge were united, by which means all judgments became extraordinary, and the distinction of what was done *in jure* and *in judicio* was abolished. In the early republic the magistrates were chosen only from the patricians, but in the course of time the plebeians shared in these honors. The chief magistrates of Athens were designated archons. They were nine in number, and none were chosen but such as were descended from ancestors who had been free citizens of the republic for three generations. They took an oath that they would observe the laws, administer justice with impartiality, and never suffer themselves to be corrupted. They all had the power of punishing malefactors with death. The chief among them was called archon, and the year took its designation from him—the *archon eponymus*, who was also constituted a sort of state protector for those who were unable to defend themselves.

MAGLIABECHI, ANTONIO, one of the most remarkable bibliophiles of his time, was born at Florence, Oct. 28, 1633, and in 1673 received the appointment of librarian to the grand-duke of Tuscany, a post

for which he had qualified himself by his vast stores of self-acquired learning. He died on July 4, 1714, bequeathing his large private library to the grand-duke, who in turn handed it over to the city.

MAGLIANO D'ALPI, or MAGLIANO DI MONDOVI, a town in Cuneo province, Piedmont, Italy, 6 miles N. by W. of Mondovi. Population 2,491.

MAGLIANO DI MARSI, a town in Aquila province, Abruzzi e Molise compartment, Italy, 6 miles N.W. of Avezzano. Population 3,923.

MAGLIANO SABINO, a town in Perugia province, Italy, 20 miles W. by S. of Rieti; has a mineral spring. Population 2,581.

MAGLIE, a town in Lecce province, Apulia, Italy, 11 miles W. by S. of Otranto. Pop. (1901), 7,500.

MAGNAN, BERNARD PIERRE, a French marshal; born at Paris, Dec. 7, 1791. He was a captain at Waterloo (1815); was employed in Algeria after 1827; suppressed the insurrection at Lyons in 1849; aided in the *coup d'état* of 1851; and was made marshal in Dec., 1852. Died at Paris May 29, 1865.

MAGNAN, VALENTIN, French alienist; born at Perpignan in 1835; graduated as M.D. in 1886, and later was appointed physician to Ste. Anne Asylum. He has written *De l'alcoolisme, des diverses formes du délire alcoolique, et de leur traitement* (1874); and *Recherches sur les centres nerveux* (1876).

MAGNANO, a village in Piacenza province, Italy, 26 miles W. of Parma. The Austrians under Kray defeated the French under Scherer here, April 5, 1799.

MAGNENTIUS, FLAVIUS POPILIUS, Roman emperor; born in Germany about A.D. 300. In A.D. 350, while governor of Rhætia, he revolted against the emperor Constans, and caused him to be murdered in his bed, usurped the empire, and became master of Rome. In 351 he was defeated by Constantius II at Mursa, in Pannonia Inferior, on the river Drave, and again in Gaul, in Aug., 353, whereupon he committed suicide.

MAGNESIA, magnesium oxide. See MAGNESIUM.

MAGNESIA, in ancient geography, was the name of two cities in Asia Minor, both of considerable interest and importance. (1) A city of Ionia, 10 miles N.E. of Miletus, and rather less from Ephesus, on a small stream flowing into the Mæander, whence it was called MAGNESIA AD MÆANDRUM. (2) A city of Lydia (the modern MANISA), 40 miles N.E. of Smyrna, on the south bank of the river Hermus, at the foot of Mount Sipylus, from which circumstance it was often called for distinction's sake MAGNESIA AD SIPYLUM. From its name it is probable that it was founded, like Magnesia ad Mæandrum, by Magnesian colonists from Thessaly; but we have no authority for the fact. Here the two Scipios defeated Antiochus the Great, 190 B.C.

MAGNESIUM, a metallic element (symbol Mg) forming a basic oxide, "magnesia," which in some form or other is universally disseminated throughout the earth's crust, apart from the large masses of mineral consisting essentially of magnesia compounds. This accounts for the presence of at least traces of magnesia in the ashes of all plants and animals, and in almost all natural waters. In these, however, it is usually present only as a quasi-contamination of the lime; in certain mineral waters, known as bitter waters (as those of Epsom, Sedlitz, Püllna), sulphate of magnesia forms the principal solid component. All native chloride of sodium is accompanied by magnesia salts, including the cases of salt springs and of ocean water, the latter containing about 0.21 per cent of magnesia as sulphate and chlorate. The metal magnesium has the color of silver, and remains unchanged in dry air; in ordinary air it tar-

nishes a little more readily than zinc does. It is malleable and ductile, but has little tenacity. The specific gravity is 1.75; thus it is considerably lighter than even aluminium, whose specific gravity is 2.6. It fuses and distils at about the same temperatures as zinc. It is generally sold in the form of thin ribbon, being used for the easy production of highly intense light. The ribbon kindles readily in a candle flame, and then continues burning most intensely by itself, the solid oxide produced radiating out abundant light.

Of magnesium salts the most important is the sulphate, EPSOM SALT, (*q.v.*) This salt serves as a raw material for the preparation of two or three medicinally important substances, especially magnesia alba.

Magnesia preparations play a great part in therapeutics. The oxide and basic carbonate (also the dissolved forms of saccharate and bicarbonate) are used in small doses as antacids, in larger ones as very mild purgatives, for children more especially. For the latter purpose, however, the sulphate is generally preferred as acting far more energetically. The nauseous bitter taste of the salt can be concealed, to some extent, by acidification of its solution with dilute sulphuric acid. Citrate of magnesia, being exceptionally free of the "*Bittererde*" taste, was introduced some thirty years ago by the French as a pleasant substitute for Epsom salt, and it has since come much into fashion everywhere, although, weight for weight, it is far less efficient than the sulphate.

MAGNETISM. The word magnetism is derived from the Greek word *magnes*, which was applied to an ore of iron possessing a remarkable attractive power for iron, and supposed to have been originally found near the town of Magnesia, in Lydia. This name is said by Plato to have been given to it by Euripides, and he adds that most call it the Heracleian stone. It is needless here to criticise the above or other derivations that have been given for the word; we merely remark that it is now applied to all the phenomena kindred to that which first drew attention to the magnetic iron ore, viz., a selective attraction for iron. It appears that the Greeks and Romans were aware, not only that the loadstone, or magnetic iron ore, attracted iron, but also that it endowed iron in contact with it with its own peculiar property. Thus an iron ring will hang suspended by the attraction of a loadstone, and from that ring another, and so on, up to a certain number, depending on the power of the stone, and the weight, etc., of the rings. They were also aware that the attraction was confined to iron, or at all events was not indiscriminate, and that it was not destroyed by the intervention of other bodies, such as brass, between the magnet and the iron.

The science of magnetism made no real progress till the invention of the mariner's compass. The early history of this instrument is very obscure. According to some authorities it was invented in China, and found its way into Europe probably through Arabian sources. The light thrown by recent researches on the literature of the Chinese has thrown doubt upon their claim to this invention, although the knowledge of the loadstone and its attractive property may have been older among them than even among the Greeks. The first accounts of the compass in Europe go back to the twelfth century, and, although the instrument described is very rough, it is not spoken of as a new invention. In its earliest form it seems to have consisted simply of an iron needle which was touched with the loadstone and placed upon a pivot, or floated on water, so that it could turn more or less freely. It was found that such a needle came to rest in a position pointing approximately north and south (some accounts say east and west, in which case there must have been a cross piece

on the needle to indicate what was probably the important direction for the mariner). As these compasses were made of iron (steel was not used till much later), and were probably ill-pivoted, they must have been very inaccurate; and the difficulty of using them must have been much increased by the want of a card, which was a later addition made apparently by the Dutch.

It is unnecessary to enter into more detail here respecting the early history of the compass, as the matter has been very fully treated in the article COMPASS. We proceed therefore to show the bearing of the invention upon the science of magnetism. It will at once be seen that it involves two scientific discoveries of capital importance:—first, that the loadstone can transmit to iron with which it comes in contact a permanent property like its own; and, secondly, that a loadstone or magnet if suspended freely will turn so that a certain direction in it assumes a fixed position relative to the geographical meridian, a certain part of the magnet turning always toward the north, and the part opposite toward the south. These opposite parts of the magnet are called its "poles."

It was in the accurate observation of the declination and dip of the magnetic needle that the science of magnetism arose. The dip appears to have been first observed by Georg Hartmann, vicar of the church of St. Sebaldus at Nuremberg (1489–1564.)

In 1576 the dip was independently discovered by Robert Norman, a skillful seaman and an ingenious artificer, according to Gilbert. He was in the habit of making compass needles, and carefully balancing them so as to play horizontally on their pivots before magnetization. He found that, after they were magnetized, they constantly dipped with the north end downward, so that a counterpoise had to be added to bring them back to the horizon. This led him to construct a special instrument, the prototype of the modern dipping needle, to show this new phenomenon. With this instrument he made the first accurate measurement of the dip, and found it to be $71^{\circ} 50'$ at London.

The early English magnetic observers, of whom Norman and Burroughs (who wrote an able supplement to Norman's work) were admirable examples, must have done much for the introduction of precise ideas into magnetism. But their fame was speedily eclipsed by William Gilbert of Colchester (1540–1603), whom Pogendorff has justly called the Galileo of magnetism, and whom Galileo himself thought enviably great. In his great work entitled *De Magnete Magneticisque Corporibus et de Magno Magnete Tellure Physiologia Nova*, first published in 1600, we find a complete account of what was known of magnetic phenomena up to his time, with a large number of new ideas and new experimental facts added by himself.

The law of the action of one permanent magnet upon another, as we have seen, is that like poles repel and unlike poles attract each other. The action of a permanent magnet on pieces of soft iron is, at first sight, different, for either pole attracts them alike.

By far the most important case of magnetic induction is the electromagnet. Whenever an electric current flows in a closed circuit, the surrounding space becomes a field of magnetic force, and any piece of iron in it will be inductively magnetized. Such an arrangement of an electric circuit and iron is called an electromagnet. The variety of form and of application of such instruments in modern science is endless. A few of the more important modifications will be considered below.

Co-existence of Induced and Permanent Magnetism.—The fact that a body is already a permanent magnet does not prevent its being susceptible to magnetic induction. If we take any piece of iron at random, the

chances are that one end or other of it will repel the north pole of a magnetic needle—in other words, it will be to some extent permanently magnetic; but if we bring it slowly nearer and nearer to the pole of the needle, provided its magnetism be not too strong, it will by and by attract the pole which it at first repelled. Again, if we take two steel magnets, which may be as powerful as we please, provided at all events that they are unequally powerful, and bring two like poles together, these poles will at first repel each other in accordance with the fundamental law of permanent magnets; but, when the distance is less than a certain amount, the repulsion passes into an attraction, and when the poles are in contact this attraction may be very considerable. These phenomena are at once explained by the law of induction. The induced or temporary magnetism is superposed on the permanent magnetism, and, when the poles are near enough, the opposite magnetism induced by the pole attracts it more than the permanent like magnetism repels it; and this happens even with steel, whose susceptibility for magnetic induction is considerably less than that of iron. This phenomenon was observed pretty early in the history of magnetism, but was not fully explained until the idea of magnetic induction was fully developed.

Influence of the Hardness and Structure of Iron and Steel on Permanent Magnetism.—Some information has already been given incidentally on this subject, and a lengthy discussion would be out of place here. The statements of the various authorities are very contradictory. This is not to be wondered at; for those best qualified to prepare the materials for experiments are generally deficient in the scientific knowledge requisite to enable them to form a sound judgment as to the result, while thoroughly trained scientific men have not, as a rule, acquired a command over the delicate manipulation of the forging and tempering of steel, an art which those who possess it usually find difficult to describe in words or reduce to rules. There is the further circumstance that many who have been successful in making good steel for magnetic or other purposes have found it for their interest not to publish the process by which success was attained.

Fineness of grain and uniformity of temper are the greatest requisites in steel for permanent magnets. The latter in bars of any size is never attained in perfection, for the surface is always harder than the interior. The mischief which thereby arises may be understood by taking the extreme case of a thin steel tube magnetized to saturation, and then fitted with a perfectly soft iron core. It is clear that the core will act very much like the armature of a horse-shoe magnet—the lines of force will run back through it, and the external action will be in a great measure destroyed.

The different tempers of steel may be roughly classified as glass hard, straw color, blue, and soft. The current statement is that the harder the steel the more difficult it is to magnetize, but the better it retains its magnetism. If this were so, provided sufficient magnetizing force to produce saturation were at command, the best temper for magnets would be glass hard. Lamont, however, whose experience was great, states that he found the loss after magnetization to be as great, and to continue as long, with glass hard as with the blue tempered magnets. The same experimenter gives it as his opinion that great differences in the quality of magnets arise more from defects as to homogeneity, continuity, and uniformity of temper than from the quality of the steel in other respects; he inclines, however, to a preference for English cast steel.

Purity and homogeneity of structure are also necessary in iron of high magnetic inductive susceptibility

and small coercive force. Hammering, rolling, and drawing diminish the susceptibility and increase the coercive force. Rolling does so more in the direction of rolling than transversely, so that the iron becomes ælotropic. It is advisable in all cases where high susceptibility is wished to anneal the body carefully after manufacture, by heating it in a wood fire and allowing it to cool very gradually; this process is still more effective when the iron is covered all over beforehand with half an inch or so of clay.

That very high temperatures destroy both the magnetic susceptibility and the power of retaining magnetism altogether has been known since the infancy of magnetic science. Thus Gilbert found that a loadstone and a piece of iron equally lost their power of affecting the magnetic needle when heated very hot, and remarks that the magnetic property returns to the iron after it has cooled a little, but that the magnetic virtue of the loadstone is altogether destroyed. Similar results were obtained by Brugmans, Boyle, Cavallo, Barlow and Bonnycastle, Christie, Ritchie, Erman, Scoresby, Seebeck, and others. Faraday found that a steel magnet lost its permanent magnetism rather suddenly at a temperature a little under the boiling point of almond oil; it behaved like soft iron till it was raised to an orange-red heat, and then it lost its magnetic susceptibility and became indifferent. The temperature at which retentive power for permanent magnetism was lost appeared to vary in steel with the hardness and structure; in fragments of loadstone it was very high; they retained their permanent magnetism until just below visible ignition in the dark, but, on the other hand, they lost their susceptibility at dull ignition, *i.e.*, at a much lower temperature than iron. Nickel was found to lose its magnetic susceptibility at a much lower temperature than iron, *viz.*, about 330° to 340° C. Cobalt is much more refractory, for it retains its susceptibility, according to Faraday, nearly up to the melting point of copper, *i.e.*, to a white heat. The writer had occasion to verify these results in the course of some experiments on the magnetic sounds in wires of iron, nickel, and cobalt traversed by an interrupted current of electricity.

The effect of extreme cold, produced in the ordinary way by means of solid carbonic acid and ether, was, according to Trowbridge, to diminish the moment of a steel magnet (magnetized at 20° C.) by about 60 per cent.

The effect of moderate alteration of temperature varies greatly according to circumstances. We shall consider separately the effect upon the magnetic susceptibility and upon the permanent magnetism; but it must be noticed that no such separation is possible in actual experiment.

The temporary magnetism of bars of cast iron, smithy iron, soft iron, soft steel, and hard steel magnetized by the earth's vertical force was found by Scoresby to be insensible at a white heat, but to be much greater at a dark red heat than at the temperature of the air. The difference was most marked in the case of hard steel, no doubt partly because of the softening of the bar. Similar experiments were made by Barlow, Seebeck, and others. Kupfer experimented on the subject, using variations of temperature between 0° and 100° C., and found the susceptibility of soft iron to increase with the temperature. Wiedemann's conclusion is that the first alteration of temperature, whether increase or decrease, increases the temporary magnetism of iron or steel, whatever the temperature at starting. If the temperature be repeatedly altered and brought back to its initial value, the magnetism continues to increase, but after a time becomes more and more nearly constant at the initial temperature. After this state has been

reached, an increase of temperature causes increase of magnetization in very hard steel bars, a decrease of temperature a decrease of magnetization; the behavior of soft steel bars is exactly opposite.

Baur and Wassmuth have recently taken up the matter with all the advantage of modern experience. The former concludes from his experiments on iron by the ring method, at temperatures between 0° and 150° C., that the magnetic susceptibility for a given magnetizing force increases with the temperature if the force be below a certain critical value (3.6 or so), but decreases as the temperature increases if the force be above that value. The smaller the magnetizing force the greater the influence of temperature on the magnetic susceptibility. The result of his experiments at very high temperatures is that, for small magnetizing forces, the susceptibility at first increases rapidly as the temperature increases, reaches a maximum at red heat, and then falls suddenly to zero. For large forces, the susceptibility decreases gradually until red heat, and then falls suddenly to a very small value. According to him, if a bar be cooled from white heat the first traces of susceptibility are observed at a very bright red, the brighter the greater the magnetizing force. He gives a variety of interesting results concerning the phenomenon of Gore, all in accordance with what we have just stated.

Canton seems to have been one of the first to study the effect of moderate variations of temperature on the permanent magnetism of iron and steel. The results of his and Hallströms experiments went to show that permanent magnetization decreases when the temperature rises, and increases again when the temperature falls. In reality, however, as was shown by Kupfer, Riess and Moser, G. Wiedemann, and others, the phenomenon is complicated; for, if we repeatedly heat a magnet and allow it to cool to its initial temperature, the magnetization lost at each heating is only partially recovered on cooling, and thus a progressive loss goes on, until at last a constant state is reached, in which the magnetization lost on heating is completely recovered on cooling. In this respect, as well as in the effect on the magnetic susceptibility already discussed, there is an analogy between the effect of temperature and the effect of strain; *i.e.*, there is a first or permanent effect and a proper or temporary temperature effect. The permanent effect is that any alteration of temperature, be it increase or decrease, diminishes the permanent magnetization just as a shock or a jar would do, and probably for a similar reason. The proper or temporary effect consists in a decrease of magnetization with increase of temperature, which is completely recovered on decrease of temperature, and *vice versa*. If this be borne in mind, together with what has already been said above, it will not be difficult for the reader to see that the order and amount of the temperature variations, the hardness and form of the bar, and its magnetic history will all influence the temperature coefficient.

The oldest form of magnet was a piece of magnetic iron ore or loadstone. The power of these natural magnets varied exceedingly from one specimen to another. An elaborate discussion of the various kinds of loadstone will be found in Gilbert's *De Magnete*. In order to increase the carrying power, the loadstone was usually fitted with armatures of soft iron upon its polar regions. A loadstone in the Teylerian Museum at Haarlem has a carrying power of 230 pounds; and one at Lisbon, presented by the emperor of China to King John V. of Portugal is said to support as much as 300 pounds. Small loadstones are often very powerful in proportion to their weight; *e.g.*, Newton is said to have worn in a ring one that weighed only three grains, and yet was able to carry about 746 grains; and one in the physical

collection at Edinburgh, formerly belonging to Sir John Leslie, weighing itself three and one-half grains, had at one time a carrying power of 1,560 grains.

The introduction of steel magnets, and the perfection to which they were gradually brought, caused the loadstone to fall into disuse. It is said that Galileo possessed the art of making steel magnets about the beginning of the seventeenth century. It was early discovered that the earth's force could be utilized in magnetizing steel. Gilbert was aware that a feeble magnetism could be produced in this way; and Michell, in his treatise on artificial magnets, minutely describes how weak magnets may be made by means of the earth's force, then combined into bundles or "magazines" and used in turn to produce stronger magnets, these used to produce still stronger, and so on.

The earliest process of all was no doubt the method of rubbing or touching by another magnet. This method of making magnets was studied with much attention by the natural philosophers of the eighteenth century, among whom we may mention Savery, Knight, Duhamel, Le Maire, Canton, Michell, Äpinus, Coulomb and Euler. The method of single touch consists simply in stroking the bar to be magnetized alternately on its two halves with the south and north poles of a loadstone or bar magnet, the stroke beginning always at the middle and ending at the end. According to Lamont, the best plan is to lay the magnet flat, overlapping one half of the bar to be magnetized, and then draw it off; when the magnet is held perpendicular to the bar during the process, the result is apt to give an irregular magnetization: *e.g.*, we may even get a magnet with its two ends north poles and with a south pole in the middle, or one with four poles, a north and south pole at the two ends and a south and north pole in the middle.

The first improvement on single touch was double touch with separate magnets. This consisted in using two magnets simultaneously on the two halves of the bar undergoing magnetization. The north pole of one and the south pole of the other are placed either close together, or at a small distance apart near the middle of the bar, and then each is drawn toward the end of the half on which it lies; according to Lamont, here, as in single touch, the magnets should be laid flat on the bar. Michell introduced the further improvement of using two bar magnets (or bundles of such) fastened together and kept parallel at a small distance apart by means of small pieces of wood, the north pole of one being continuous with the south pole of the other. This pair is placed vertical with one end on the middle of the bar, drawn toward one end and slipped off, then replaced on the middle and drawn to the other end, and so on alternately until the moment of the bar ceases to increase any further. Instead of the pair of bar magnets a horse-shoe magnet might of course be used.

Le Maire introduced the essential improvement of placing the bar to be magnetized upon a larger bar, and then magnetizing the two together. The advantage of this is best seen in the form of the same device adopted by Canton and Duhamel, who magnetized steel bars in pairs, connecting them up parallel to each other by means of two pieces of soft iron, and then magnetizing them in opposite directions. It is easy to see that the magnetization of the one reacts on the magnetization of the other and strengthens it. Michell obtained a similar advantage by magnetizing a number of bars placed end to end in a line; he found, as was to be expected, that the end bars were weaker, but this defect he remedied by repeating the process with the bars arranged in a different order. Coulomb's method was to place the ends of the bar on the north and south poles of two bar magnets arranged in line at the proper distance apart

This process of connecting up the bars to be magnetized in a closed magnetic circuit is sometimes called circular touch; it can be applied to horse-shoe magnets by placing a pair of them with their ends together, and then passing round and round upon them a horse-shoe magnet or a pair of bar magnets arranged as already described.

Immediately after CErsted's discovery of the magnetic action of the galvanic current, Arago, Boissgiraud, and Davy almost simultaneously applied this property to the magnetization of iron and steel. Powerful electromagnets, with cores of soft iron, were first constructed a few years later by Sturgeon and Brewster. Pohl, Moll, and Pfaff in Germany, and Henry and Ten Eyck in America, may be mentioned as the most successful of the early constructors. One of the electromagnets of Henry and Ten Eyck reached a carrying power of 2,061 pounds; but magnets specially constructed for carrying power have surpassed this limit. As a specimen of scientific toys of this description may be mentioned the electromagnet of Roberts, which consists of a square block of iron deeply slotted with four parallel grooves into which three layers of copper wire cable are wound in zigzag fashion so that the current converts the flanges alternately into north and south poles; the armature is a square block planed to fit the face of the magnet. The carrying power of a machine of this kind was 2,949 pounds, *i.e.*, more than one and one-fourth tons!

The forms of electromagnet used in the arts, *e.g.*, in electric bells, fire alarms, telegraphs, telephones, electric light regulators, dynamo machines, etc., are simply innumerable. It will be sufficient to allude to those constructed for the purpose of producing an intense magnetic field, uniform or non-uniform, over a larger or smaller area; these find their practical application in the construction of dynamo-electric machines, but they are mainly interesting to purely scientific men on account of their use in the investigation of the properties of weakly magnetic bodies.

MAGNETISM, ANIMAL. The terms *animal magnetism*, *electro-biology*, *mesmerism*, *clairvoyance*, *odalic* or *odic force*, and *hypnotism* have been used to designate peculiar nervous conditions in which the body and mind of an individual were supposed to be influenced by a mysterious force emanating from another person. With the exception of *mesmerism*, a name given to the phenomena in honor of one of their earliest investigators, F. A. Mesmer, each of these terms implies a theory. Thus the phenomena of *animal magnetism* were supposed to be due to some kind of magnetic force or influence peculiar to living beings and analogous to the action of a magnet upon steel or certain metals; *electro-biology*, a more modern term, introduced in 1850 by two American lecturers, referred the phenomena to the action of electrical currents generated in the living body, and capable of influencing electrically the bodies of others; *clairvoyance* implied a power of mental vision or of mental hearing, or of a mental production of other sensations, by which the individual became aware of events happening in another part of the world from where he was, or could tell of the existence of objects which could not affect at the time any of his bodily senses; *odalic force* was a term given to a force of a mysterious character by which all the phenomena of animal magnetism might be accounted for; and *hypnotism*, from *hypnos*, sleep, was a name applied to a condition artificially produced in which the person was apparently asleep and yet acted in obedience to the will of the operator as regards both motion and sensation.

It was natural that the apparent power of influencing the bodies and minds of others should attract much at-

tention and be eagerly sought after for the purposes of gain, or from a love of the marvelous, or for the cure of diseases. Hence we find that, while not a few have investigated these phenomena in a scientific spirit, more have done so as quacks and charlatans who have thrown discredit on a department of the physiology of man of the deepest interest. Recently, however, physiologists and physicians have set about investigating the subject in such a manner as to bring it into the domain of exact science, and to dispel the idea that the phenomena are due either to any occult force or to supernatural agency. It would appear that in all ages diseases were alleged to be affected by the touch of the hand of certain persons, who were supposed to communicate a healing virtue to the sufferer. It is also known that among the Chaldeans, the Babylonians, the Persians, the Hindus, the Egyptians, the Greeks, and the Romans, many of the priests effected cures, or threw people into deep sleeps in the shades of the temples, during which the sleeper had prophetic dreams, and that they otherwise produced effects like those now referred to animal magnetism. Such influences were held to be supernatural, and no doubt they gave power to the priesthood. In the middle of the seventeenth century there appeared in England several persons who said they had the power of curing diseases by stroking with the hand. Notable among these was Valentine Greatrakes, of Affane, in the county of Waterford, Ireland, who was born in February, 1728, and who attracted great attention in England by his supposed power of curing the king's evil, or scrofula. Many of the most distinguished scientific and theological men of the day, such as Robert Boyle and R. Cudworth, witnessed and attested the cures supposed to be effected by Greatrakes, and thousands of sufferers crowded to him from all parts of the kingdom.

Phenomena of a marvelous kind, more especially such as imply a mysterious or supernatural power exercised by one person over another, not only attract attention, but take so firm a hold on the imagination that belief in them breaks out now and again with all the intensity of an epidemic. Thus since the time of Greatrakes, at short intervals, men have arisen who have led the public captive at their will. About the middle of the eighteenth century John Joseph Gassner, a Roman Catholic priest in Swabia, took up the notion that the majority of diseases arose from demoniacal possession, and could only be cured by exorcism. His method was undoubtedly similar to that followed by Mesmer and others, and he had an extraordinary influence over the nervous systems of his patients. Gassner, however, believed his power to be altogether supernatural and connected with religion.

Friedrich (or Franz) Anton Mesmer was born at Weil, on May 23, 1733. He studied medicine at Vienna under the eminent masters of that day, Van Swieten and De Haen, took a degree, and commenced practice. Interested in astrology, he imagined that the stars exerted an influence on beings living on the earth. He identified the supposed force first with electricity, then with magnetism; and it was but a short step to suppose that stroking diseased bodies with magnets might effect a cure. He published his first work (*De Planetarum Influsu*) in 1766. Ten years later, on meeting with Gassner in Switzerland, he observed that the priest effected cures without the use of magnets, by manipulation alone. This led Mesmer to discard the magnets, and to suppose that some kind of occult force resided in himself by which he could influence others. He held that this force permeated the universe, and more especially affected the nervous systems of men. He removed to Paris in 1778, and in a short time the

French capital was thrown into a state of great excitement by the reported marvelous effects of mesmerism. Mesmer soon made many converts; controversies arose; he excited the indignation of the medical faculty of Paris, who stigmatized him as a charlatan; still the people crowded to him. He refused an offer of 20,000 francs from the government for the disclosure of his secret, but it is asserted that he really told all he knew privately to any one for 100 louis. He received private rewards of large sums of money. Appreciating the effect of mysterious surroundings on the imaginations of his patients, he had his consulting apartments dimly lighted and hung with mirrors; strains of soft music occasionally broke the profound silence; odors were wafted through the room; and the patients sat round a kind of vat in which various chemical ingredients were concocted or simmered over a fire. Holding each others' hands, or joined by cords, the patients sat in expectancy, and then Mesmer, clothed in the dress of a magician, glided amongst them, affecting this one by a touch, another by a look, and making "passes" with his hand toward a third. The effects were various, but all were held to be salutary. Nervous ladies became hysterical or fainted; some men became convulsed, or were seized with palpitations of the heart or other bodily disturbances. The government appointed a commission of physicians and members of the Academy of Sciences to investigate these phenomena; Franklin and Baillie were members of this commission, and drew up an elaborate report admitting many of the facts, but contesting Mesmer's theory that there was an agent called animal magnetism, and attributing the effects to physiological causes. Mesmer himself was undoubtedly a mystic; and, although the excitement of the time led him to indulge in mummery and sensational effects, he may have been honest in the belief that the phenomena produced were real, and called for further investigation. For a time, however, animal magnetism fell into disrepute; it became a system of downright jugglery, and Mesmer himself was denounced as a shallow empiric and impostor. He withdrew from Paris, and died at Meersburg in Switzerland on March 5, 1815. He left many disciples, the most distinguished of whom was the Marquis de Puységur. This nobleman revolutionized the art of mesmerism by showing that many of the phenomena might be produced by gentle manipulation causing sleep, and without the mysterious surroundings and violent means resorted to by Mesmer. The gentler method was followed successfully by Deleuze, Bertrand, Georget, Rostan, and Foissac in France, and by Dr. John Elliotson in England up to about 1830.

The next great step in the investigation of these phenomena was made by James Braid, a surgeon in Manchester, who in 1841 began the study of the pretensions of animal magnetism or mesmerism, in his own words, as a "complete sceptic" regarding all the phenomena. This led him to the discovery that he could artificially produce "a peculiar condition of the nervous system, induced by a fixed and abstracted attention of the mental and visual eye on one object, not of an exciting nature." To this condition he gave the name of *neurohypnotism* (from *νεῦρον*, nerve, *ὑπνος*, sleep); for the sake of brevity, *neuro* was suppressed, and the term *hypnotism* came into general use. Braid read a paper at a meeting of the British Association in Manchester on June 29, 1842, entitled *Practical Essay on the Curative Agency of Neuro-Hypnotism*; and his work *Neurypnology, or the Rationale of Nervous Sleep considered in relation with Animal Magnetism, illustrated by numerous cases of its successful application in the relief and cure of disease*, was published in 1843. It is necessary to point this out, as certain recent Con-

tinental writers have obtained many of Braid's results by following his methods, and have not adequately recognized the value of the work done by him forty years ago. Braid was undoubtedly the first to investigate the subject in a scientific way, and to attempt to give a physiological explanation. In this he was much aided by the physiologist Herbert Mayo, and also by Dr. William B. Carpenter—the latter being the first to recognize the value of Braid's researches as bearing on the theory of the reflex action of the ganglia at the base of the brain and of the cerebrum itself, with which Carpenter's own name is associated.

Recently the subject has been reinvestigated by Professor Weinhold of Chemnitz, and more particularly by Dr. Rudolf Heidenhain, professor of physiology in the university of Breslau, who has published a small but interesting work on animal magnetism. In this work Heidenhain attempts to explain most of the phenomena by the physiological doctrine of inhibitory nervous action. The usual method of inducing the mesmeric or hypnotic state is to cause the person operated on to stare fixedly at a faceted or glittering piece of glass held at from eight to fifteen inches from the eyes, in such a position above the forehead as will strain the eyes and eyelids. The operator may stand behind the patient, and he will observe that the pupils are at first contracted from the effort of accommodation of each eye for near vision on the object; in a short time the pupils begin to relax, and then the operator makes a few "passes" over the face without touching it. The eyelids then close; or the operator may gently close them with the tips of the fingers, at the same time very gently stroking the cheeks. Often a vibratory motion of the eyelids may be observed when they are closed, or there may be slight spasm of the eyelids. The eyes may afterward become widely opened. The patient is now in a sleep-like condition, and the limbs often remain in almost any position in which the operator may place them, as in a cataleptic condition. At the same time the patient may now be caused to make movements in obedience to the commands of the operator, and to act according to ideas suggested to him. Thus, he may eat a raw onion with gusto, apparently under the impression that it is an apple; he may make wry faces on drinking a glass of water when told that what he is taking is castor oil; he may ride on a stool as in a horse race, he may fight with imaginary enemies, or show tokens of affection to imaginary friends; in short, all kinds of actions, even of a ridiculous and a degrading nature, may be done by the patient at the command of the operator. Another class of phenomena consists in the production of stiffness or rigidity of certain muscles, or groups of muscles, or even of the whole body. For example, on stroking the fore arm it may become rigid in the prone or supine condition; the knees may be strongly bent, with the muscles in a state of spasm; the muscles of the trunk may become so rigid as to allow the body to rest like a log, head and heels on two chairs, so stiff and rigid as to bear the weight of the operator sitting upon it; or various cataleptic conditions may be induced and as readily removed by a few passes of the hand. Many disorders of sensation have been observed, such as defective color perception, the hearing of special sounds which have no objective existence, or deafness to certain tones, or perverted sensations, such as tingling, prickling, rubbing, etc., referred to the skin. The patient may remain in this condition for an hour or more, and may then be roused by holding him for a few minutes and blowing gently into the eyes. Usually the patient has a vague recollection, like that of a disturbed dream, but sometimes there is an acute remembrance of all that has happened, and even a feeling of pain.

naving been compelled to do ridiculous actions. Certain persons are more readily hypnotized than others, and it has been observed that, once the condition has been successfully induced, it can be more easily induced a second time, a third time more easily than a second, and so on until the patient may be so pliant to the will of the operator that a fixed look, or a wave of the hand, may throw him at once into the condition. Such are the general facts in artificially induced hypnotism, and they belong to the same class as those referred to animal magnetism, electro-biological effects, odylic influences, etc., according to the whim or theory of the operator.

It is not surprising that such phenomena have been the cause of much wonder and the basis of many superstitions. Some have supposed that they were supernatural, others that they indicated the existence of a specific force exerted by the experimenter upon the passive subject. Many operators have no doubt believed they possessed such a force; such a belief would not affect the success of their experiments except to make them more likely to be successful, as the operator would readily comply with all the conditions; but most of these phenomena can be explained physiologically, and those which cannot be so accounted for will remain hidden until we get further light on the physiology of the nervous system.

MAGNOLIA, L., the typical genus of the order *Magnoliaceæ*, named from Pierre Magnol, professor of medicine and botany at Montpellier. It contains about fourteen species, distributed in Japan, China, and the Himalayas, as well as in North America.

Magnolias are trees or shrubs with evergreen or deciduous foliage. They bear conspicuous, and often large, fragrant, white, rose, or purple flowers. The petals are three in number, the petals six to twelve, in two to four series of three in each, the stamens and carpels being numerous. The fruit consists of a number of follicles which dehisce (contrary to the rule) along the outer edge to allow the scarlet or brown seeds to escape, but which are suspended by a long slender thread.

The first of the American species brought to Europe (in 1688, by Banister) was *M. glauca*, L. It is found in low situations near the sea from Massachusetts to Louisiana—more especially in New Jersey and Carolina. In 1712, Catesby visited Virginia and found *M. acuminata*, L., the so-called cucumber tree, from the resemblance of the young fruits to small cucumbers. It ranges from Pennsylvania to Carolina. The wood is yellow, and used for bowls; the flowers are rather small. He also found *M. umbrellata*, Lam. (*tripetala*, L.), called the umbrella tree. The flowers are very large, white, and highly scented. *M. pyramidata*, Bart., discovered by Bartram in 1773, is a native of the western parts of Carolina and Georgia. The most beautiful species of North America is *M. grandiflora*, L., discovered by Catesby in 1719 in South Carolina and Florida, and introduced into England in 1734. It grows a straight trunk two feet in diameter, and upward of seventy feet high, bearing a profusion of large powerfully lemon-scented creamy-white flowers.

MAGNUS, HEINRICH GUSTAV, an eminent German chemist and physicist, was born at Berlin May 2, 1802, and died in 1870.

MAGNUSSON, ARNI, a scholar to whom we are largely indebted for the preservation of the old Icelandic literature, was born in the west of Iceland in 1663 and died in 1730.

MAGO was one of the most common Carthaginian names, borne among others by the reputed founder of the military power of Carthage, and the Punic admiral in the war with the elder Dionysius (see Carthage). The most famous of the name was the youngest of the three sons of Hamilcar Barca.

MAGPIE, or simply **PIE** (French, *Pie*), the prefix being the abbreviated form of a human name (Margaret) applied as in so many other instances to familiar animals, as this bird once was throughout Great Britain, though of late years almost exterminated in many parts, and now nearly everywhere scarce. Its pilfering habits have led to this result, yet the injuries it causes are unquestionably exaggerated by common report; and in many countries of Europe it is still the tolerated or even the cherished neighbor of every farmer, as it formerly was in England if not in Scotland also. It is a species that when not molested is extending its range, as Wolley ascertained in Lapland, where within the last century it has been gradually pushing its way along the coast and into the interior from one fishing-station or settler's house to the next, as the country has been peopled.

At large few European birds possess greater beauty, the pure white of its scapulars and inner web of the flight-feathers contrasting vividly with the deep glossy black on the rest of its body and wings, while its long tail is lustrous with green, bronze, and purple reflections. The Pie's nest is a wonderfully ingenious structure, placed either in high trees or low bushes, and so massively built that it will stand for years. Herein are laid from six to nine eggs, of a pale bluish-green freckled with brown and blotched with ash-color. Superstition as to the appearance of the Pie still survives even among many educated persons.

The Pie belongs to the same family of birds as the Crow and is the *Corvus pica* of Linnaeus, the *Pica caudata*, *P. melanoleuca*, or *P. rustica* of modern ornithologists, who have recognized it as forming a distinct genus, but the number of species thereto belonging has been a fruitful source of discussion. In the west of North America, and in some of its islands, a Pie is found which extends to the upper valleys of the Missouri and the Yellowstone, and has long been thought entitled to specific distinction as *P. hudsonia*; but its claim thereto is now disallowed by some of the best ornithologists of the United States, and it can hardly be deemed even a geographical variety of the Old-World form. In California, however, there is a permanent race if not a good species, *P. nuttalli*, easily distinguishable by its yellow bill and the bare yellow skin round its eyes; and it is a curious fact that on two occasions in the year 1867 a bird apparently similar was observed in Great Britain.

MAHĀBALĒSHWAR, a hill station in Satāra district, and the principal sanitarium in the Bombay presidency, India.

MAHABHARATA. See SANSKRIT LITERATURE.

MAHĀNADI, or **MAHANUDDY** ("The Great River"), a river of India, rising twenty-five miles south of Raipur town, in a wild, mountainous region of the Central Provinces. At first an insignificant stream, it flows in a tortuous easterly course through the hills in a rocky bed until it reaches Dholpur in Orissa. From this point it rolls its unrestrained waters straight for the outermost line of the Eastern Ghāts.

MAHANROY CITY, a town of the United States, in Mahanoy township, Schuylkill county, Penn., lies at a height of 1,211 feet above the sea, fifty-six miles northeast of Harrisburg, with a station both on the Lehigh Valley and on the Philadelphia and Reading Railway. It was founded in 1859, and owes its existence to the great anthracite mines in the neighborhood. Population (1900), 13,504.

MAHASEER, or **MAHSEER** (*Barbus mosal*), a kind of barbel, abundant in the rivers of India, especially in pools of the upper and more rapid streams, where they issue from the mountainous part of the country. It is one of the largest species of the family of carps, attaining to a length of from three to five feet, and exceeding

sometimes a weight of seventy pounds. To the fisherman in India the mahaseer affords the same kind of sport as the salmon in the United States, and it rivals that fish as regards size, strength, and activity. Its flesh is likewise much esteemed.

MAHDÍ, i.e., "he who is guided aright," the third caliph of the house of 'Abbás (see MOHAMMEDANISM). The name of Mahdí is also that which the Shi'ite Mohammedans give to their Messiah, the last of the Imáms of the house of 'Alí. It was under the name of al-Mahdí that Mokhtár proclaimed 'Alí's son Mohammed as the opponent of the caliph 'Abd al-Malik, and, according to Shahrastani, the doctrine of the Mahdí, the hidden deliverer who is one day to appear and fill the oppressed world with righteousness, first arose in connection with a wild notion that this Mohammed had not died but lived concealed at Mount Radwá, near Mecca, guarded by a lion and a panther. The hidden Imám of the common Shi'ites is, however, the twelfth Imám, Mohammed Abu'l-Kásim, who disappeared mysteriously 879 A.D. The belief in the appearance of the Mahdí readily lent itself to imposture. Of the many pretendants to this dignity known in all periods of Moslem history down to the present day the most famous was the first caliph of the Fatimite dynasty, in North Africa, 'Obaid-alláh al-Mahdí, who reigned 909-934 A.D. From him was named the capital of the dynasty, the once mighty city of Mahdiya, the port and entrepôt of Kairawán. Another great historical movement, headed by a leader who proclaimed himself the Mahdí (Mohammed ibn Abdallah ibn Túmrut), was that of the ALMOHADES, (q.v.)

In 1880 another Mahdí arose and carried before him the entire population of the Soudan, successfully resisting all attempts to subjugate him, and causing the assassination of General Gordon, who had been sent as an intermediary for the purpose of effecting a peaceful evacuation of the Soudan by the Egyptian troops. About a year after this latter event the Mahdí was reported to have died of smallpox, and was succeeded by another, who, although nothing is at present known about him, seems at least able to hold his own in his mastery of the people, and to resist all efforts to crush him.

MAHÉ, a French settlement and town, in the Malabar district, Madras, India, with an area of 1,445 acres. It is the only French possession on the west coast of India, and is in charge of a *chef-de-service*, subordinate to the governor-general at Pondicherry. Pop. (1901), 9,236.

MAHI KANTHA, THE, a group of native states forming a political agency under the government of Bombay, India, with an area of about 4,000 square miles, and an estimated population of 447,056.

MAHMÚD OF GHANZNI, known also as Mahmúd, son of Subuktigin, was born October 2, 971. His fame rests chiefly on his successful wars, in particular his numerous invasions of India.

In 994 Mahmúd was made governor of Khorásán, with the title of "Sword of the State," by the Sâmání emir, Abd' ul Malik Núh. Two years later, his father Subuktigin died in the neighborhood of Balkh, having declared his second son, Ismáíl, who was then with him, to be his successor. As soon as Ismáíl had assumed the sovereignty at Balkh, Mahmúd, who was at Nishápúr, addressed him in friendly terms, proposing a division of the territories held by their father at his death. Ismáíl rejected the proposal, and was immediately attacked by Mahmúd and defeated. Retreating to Ghazni, he there yielded, and was imprisoned, and Mahmúd obtained undisputed power as sovereign of Khorásán and Ghazni (997).

Mahmúd's army first crossed the Indus in 1001,

opposed by Jaipál, raja of Lahore, Jaipál was defeated, and Mahmúd, after his return from this expedition is said to have taken the distinctive appellation of *Ghází* ("Valiant for the Faith"), but he is rarely so called. On the next occasion (1005) Mahmúd advanced as far as Bhera on the Jhelum, when his adversary Anang-pál, son and successor of Jaipál, fled to Kashmir. The following year saw Mahmúd at Multan. When he was in the Punjab at this time, he heard of the invasion of Khorásán by Ilak Khan, ruler of Transoxiana (whose daughter Mahmúd had married). After a rapid march back from India, Mahmúd repelled the invaders. Ilak Khan, having retreated across the Oxus, returned with reinforcements, and took up a position a few miles from Balkh, where he was signally defeated by Mahmúd.

Two years had elapsed since his last visit to India when Mahmúd again entered the Punjab (1008), this time for the express purpose of chastising Séwah Pál, who, having become a Mussulman, and been left by Mahmúd in charge of Multan, had relapsed to Hinduism. The Indian campaign of the following year (1009) was a notable one. Near the Indus Mahmúd was opposed again by Anang-pál, supported by powerful rajahs from other parts of India. After a severe fight, Anang-pál's elephants were so terror-struck by the fire-missiles flung among them by the invaders that they turned and fled, the whole army retreating in confusion and leaving Mahmúd master of the field. Mahmúd, after this victory pushed on through the Punjab to Nagar-kót (Kangra), and carried off much spoil from the Hindu temples to enrich his treasury at Ghazni. In 1011 Mahmúd, after a short campaign against the Afghans under Mohammed ibn Súr in the hill country of Ghor, marched again into the Punjab. The next time (1014) he advanced to Thanésar, another noted stronghold of Hinduism, between the Sutlej and the Jumna. Having now found his way across all the Punjab rivers, he was induced on two subsequent occasions to go still farther. But first he designed an invasion of Kashmir (1015), which was not carried out, as his progress was checked at Lóh-kót, a strong hill-fort in the northwest of the Punjab. And then before undertaking his longer inroad into Hindustan he had to march north into Khwárizm (Khiva) against his brother-in-law Mamún, who had refused to acknowledge Mahmúd's supremacy. The result was as usual, and Mahmúd having committed Khwárizm to a new ruler, one of Mamún's chief officers, returned to his capital. Then in 1018, with a very large force, he proceeded to India again, extending his inroad this time to the great Hindu cities of Mathra on the Jumna and Kanauj on the Ganges. To the glory of reducing the one and receiving the submission of the other he added, as was his custom, the further satisfaction of carrying back great stores of plunder from both to his own country. Three years later he went into India again, marching over nearly the same ground, to the support, this time, of the raja of Kanauj, who, having made friendship with the Mohammedan invader on his last visit, had been attacked by the raja of Kalinjar. But Mahmud found he had not yet sufficiently subdued the idolaters nearer his own border, between Cabul and the Indus, and the campaign of the year 113 (1022 A.D.) was directed against them, and reached no farther than Peshawar. Another march into India the following year was made direct to Gwalior.

The next expedition (1025) is the most famous of all. The point to which it was directed was the temple of Somnath on the coast of the Gujerát peninsula. After an arduous journey by Multan, and through part of Rajputana, he reached Somnath, and met with a very

vigorous but fruitless resistance on the part of the Hindus of Gujerát. Moslem feet soon trod the courts of the great temple. The chief object of worship it contained was broken up, and the fragments kept to be carried off to Ghazni.

After the successes at Somnath, Mahmúd remained some months in India before returning to Ghazni. Then in 1026 he crossed the Indus once more into the Punjab. His brilliant military career closed with an expedition to Persia, in the third year after this, his last visit to India. The Indian campaigns of Mahmúd and his father were almost, but not altogether, unvarying successes. The Moslem historians touch lightly on reverses. And, although the annals of Rajputana tell how Subuktigin was defeated by one raja of Ajmir and Mahmúd by his successor, the course of events which followed shows how little these and other reverses affected the invader's progress. Mahmúd's failure at Ajmir, when the brave raja Bisal-deo obliged him to raise the siege but was himself slain, was when the Moslem army was on its way to Somnath. Yet Mahmúd's Indian conquests, striking and important in themselves, were, after all, in great measure barren, except to the Ghazni treasury. Mahmúd retained no possessions in India under his own direct rule. But after the repeated defeats, by his father and himself, of two successive rajas of Lahore, the conqueror assumed the right of nominating the governors of the Punjab as a dependency of Ghazni, a right which continued to be exercised by seven of his successors. And for a time, in the reign of Masáúid II. (1098-1114), Lahore was the place of residence of the Ghaznavi sovereign. Certain silver coins of Mahmúd's reign bear inscriptions in Sanskrit characters as well as Arabic, betokening sovereignty in India. They are dated 418 and 419 A.H., the two years immediately following his last visit to the Punjab, and are struck at a place called by his name, Mahmúdpúr, supposed to be Lahore. There are also copper coins struck at Lahore (now retaining legible dates) bearing Mahmúd's name and the caliph's, in Arabic characters only. Mahmúd's coins are numerous and historically important. They were issued from mints at Nisábúr, Hirát, Ghaznah (a common alternative form of the name), Farwán, and Balkh, besides Mahmúdpúr, and Lahore, just mentioned. Mahmúd died at Ghazni in 1030, the year following his expedition to Persia, in the sixty-first year of his age and thirty-third of his reign.

MAHOGANY, a familiar dark-colored wood largely used for household furniture, and supplied by a large tree indigenous to Central America and the Antilles. It was originally received from Jamaica; 521,300 feet were exported from that island in 1753. *Swietenia Mahogani*, L., is the sole species of the genus of the order *Meliaceæ*. It bears imparipinnate leaves, like those of the ash, and panicles of small pentamerous flowers with ten monadelphous stamens. The fruit is a pear-shaped woody capsule, with many-winged seeds. The dark-colored bark has been considered a febrifuge, and the seeds were used by the ancient Aztecs with oil for a cosmetic, but the most valuable product is the timber, first noticed by the carpenter on board Sir Walter Raleigh's ship in 1595, for its great beauty, hardness, and durability. Doctor Gibbons brought it into notice as well adapted for furniture in the early part of the eighteenth century, and its use as a cabinet wood was first practically established by a cabinetmaker named Wollaston, who was employed by Gibbons to work up some mahogany brought to England by his brother. Since its introduction no wood has been more generally used for cabinet-making purposes, and none possesses like advantages of combined soundness, large size, uni-

form grain, durability, beauty of color, and richness of figure.

MAHOMET. See MOHAMMEDANISM.

MAHONY, FRANCIS, "Father Prout," Roman Catholic priest, scholar, journalist, song-writer, and humorist, was born at Cork of a respectable middle-class family in 1804. His classical education was chiefly obtained at a Jesuit college at Amiens, and after studying theology at Paris he received clerical ordination, and served in Switzerland and Ireland. It might have been expected that with his great gift of poetical expression he would have left behind him more of what was exclusively his own. What he has given us in this line tends chiefly to show that with all his sarcastic and cynical wit his genius had also its tender, serious, and sentimental side. In 1846 Mahony became "own correspondent" at Rome to the *Daily News*, and his letters from that capital gave very vivid pictures, and contain much valuable and interesting information, of the first years, so full of liberal promise, of the reign of Pius IX. The last twelve or fifteen years of his life were spent at Paris, from which he supplied the *Globe* with a series of piquant letters on the incidents of the day. His death took place in May, 1866.

MAHRATTAS. The Mahrattas inhabit that portion of India which is known by the ancient name of Mahârâshtra (Sanskrit for the great kingdom or region). This large tract, extending from the Arabian Sea on the west to the Sâtpura mountains in the north, comprises a good part of western and central India, including the modern provinces of the Concan, Khandesh, Berar, the British Deccan. Its area amounts to about 120,000 square miles, and its population to about 12,000,000 of souls, or 100 to the square mile. The population has increased greatly in the nineteenth century under British rule; but there had been much decrease during the seventeenth and eighteenth centuries owing to war and devastation. Frightful depopulation occurred from the famine which was at its height in 1400 A.D., and was called the Dûrga Dévi or the goddess of destruction. Much mortality was also caused by famine between 1801 and 1803. There was probably a period of high prosperity during the first centuries of the Christian era, under a number of petty indigenous sovereigns, among whom these wide territories had become parceled out before the first invasion of the Deccan by the Moslems about 1100.

The etymology of the word Mahratta (or Marhatta, as it is written in the vernacular) is uncertain. The name does not indicate a social caste, or a religious sect; it is not even tribal. It embraces the people of all races who dwell in the region of Mahârâshtra, both high-caste and low-caste Hindus; it is applied, of course, to Hindus only. Thus there are Mahratta Brahmans, next Mahratta Kumbis or cultivators, and Mahratta Rajputs or warriors, though the latter have but a small infusion of real Rajput blood. The Mahrattas, then, are essentially Hindus in religion and in caste ordinances, not differing in these respects from the Hindus in other parts of India. They have a language of their own called the Mahratti, a dialect of the Sanskrit—a copious, flexible, and sonorous tongue.

But the Mahrattas have always been a separate nation of people, and still regard themselves as such, though nowadays they are almost all under British or Mohammedan jurisdiction; that is, they belong either to British India or to the Nizam's Dominions. A few states or principalities purely Mahratta—such as Kolhapur and some lesser states clustering round it in the southern Deccan—still survive, but they are under close supervision on the part of the British Government. There are indeed still three large native states nominally

Mahratta, namely, that of Sindhia near the borders of Hindustan in the north, that of Holkar in Malwa in the heart of the Indian continent, and that of the Gaekwar in Gujerat on the western coast. But in these states the prince, his relatives, and some of his ministers or employés only are Mahrattas; the nobility and the mass of the people are not Mahrattas at all, but belong to other sections of the Hindu race. These states then are not to be included in the Mahratta nation, though they have a share in the Mahratta history, and are concerned in the extraneous achievements of that people.

In general terms the Mahrattas, as above defined, may be described under two main heads, first the Brahmans, and secondly the humble or low-caste men. The Mahratta Brahmans possess, in an intense degree, the qualities of that famous caste, physical, intellectual, and moral. They have generally the lofty brow, the regular features, the spare upright figure, the calm aspect, the commanding gait, which might be expected in a race maintained in great purity yet upon a broad basis. In modern times they have proved themselves the most able and ambitious of all the Brahmans in the Indian empire. They are notably divided into two sections—the Concanast, coming from the Concan or littoral tract on the west coast below the Western Ghât mountains, and the Dêshast, coming from the uplands or Deccan, on the east of the mountains. Though there have been many distinguished Dêshasts, yet the most remarkable of all have been Concanasts. For instance, the peshwas, or heads of the Mahratta confederation which at one time dominated nearly all India, were Concanast Brahmans. The birthplaces of these persons are still known, and to this day there are sequestered villages, nestling near the western base of the Ghâts, which are pointed to as being the ancestral homes of men who two centuries ago had political control over the Indian empire.

Apart from the Brahmans, the Mahrattas may be generally designated as Sûdras, or men of the humblest of the four great castes into which the Hindu race is divided. But, as indicated above, the upper classes among the Mahrattas claim to be Kshattriyas or Rajputs. They probably are aborigines fundamentally, with a mixture of what are now called the Scythian tribes, which at a very early time overran India. They have but a slight admixture of the Aryans, who victoriously immigrated from Central Asia and established the Hindu system.

These ordinary Mahrattas, who form the backbone of the nation, have plain features, an uncouth manner, a clownish aspect, short stature, a small but wiry frame. Their eyes, however, are bright and piercing, and under excitement will gleam with passion. Though not powerful physically as compared with the northern races of the Punjab and Oudh, they have much activity and an unsurpassed endurance. Born and bred in or near the Western Ghât mountains and the numerous tributary ranges, they have all the qualities of mountaineers. Among their native hills they have at all times evinced desperate courage. Away from the hills they do not display remarkable valor, except under the discipline which may be supplied by other races. For such organization they have never, of themselves, shown any aptitude. Under civilized authority, however, they are to be reckoned among the good soldiers of the empire. In recent times they enter military service less and less, betaking themselves mainly to cultivation and to the carrying business connected with agriculture. As husbandmen they are not remarkable; but as graziers, as cartmen, as laborers, they are excellent. As artisans they have seldom signalized themselves, save as armorers and clothweavers.

Those Mahrattas who dwell in the extreme west of Mahārāshtra, within the main range of the Western Ghâts, and in the extreme north of Mahārāshtra near the Sâtpura mountains, are blessed with unfailling rainfall and regular seasons. But those who dwell at a distance from these main ranges, or among the lower or subsidiary ranges, are troubled with variable moisture and uncertain seasons, frequently, too, with alternations of drought and of flood. Periodically they are afflicted by scarcity, and sometimes by severe famine. They have within the last half century largely extended their area of cultivation. Their industry, which is chiefly agricultural, has grown apace. Their tendency is undoubtedly to increase in numbers; and, despite occasional depopulation from disasters of season, they have increased considerably on the whole. But in some districts, owing to the famine of 1877, and the sickness which ensued when excessive rainfall followed the drought, the population has been stationary, while in others it has actually retrograded because epidemics and plagues of vermin were added to the misfortunes of season.

The Mahratta peasantry possess manly fortitude under suffering and misfortune. Though patient and good-tempered in the main, they have a latent warmth of temper, and if oppressed beyond a certain endurable limit they would fiercely turn and rend their tormentors. Cruelty also is an element in their character. As a rule they are orderly and law-abiding, but traditions of plunder have been handed down to them from early times, and many of them retain the predatory instincts of their forefathers. The neighborhood of dense forests, steep hillsides, and fastnesses hard of access offers extraordinary facilities to plunderers for screening themselves and their booty. Thus gang robbery is apt to break out, gains head with rapidity, and is suppressed with difficulty. In time of peace it is kept under, but during war, or whenever the bands of civil order are loosened, it becomes a cause of anxiety and a source of danger. The women have frankness and strength of character; they work hard in the fields, and as a rule evince domestic virtue. Conjugal infidelity, however, is not unknown among them, and here, as elsewhere in India, leads to bloodshed.

Though they have produced some poetry, the Mahrattas have never done much for Oriental literature. Nor have they been distinguished in industrial art. Their architecture in wood, however, was excellent; and the teak forests of their country afforded the finest timber for building and for carving. They had also much skill in the construction of works for the supply of drinking water on a large scale, and for irrigation.

The first collision with the English occurred in 1780; it arose from a disputed succession to the peshwaship. The English Government at Bombay supported one of the claimants, and the affair became critical for the English as well as for the Mahrattas. It was at this conjuncture that Warren Hastings displayed his political genius and rendered signal service to his country.

The next collision happened in 1803. The peshwa had fallen into grave difficulties with some of the principal members of the Mahratta confederation, namely, Sindhia, Holkar, and the Bhonsla raja of Nagpur. He therefore placed himself under British protection, and this led to the great Mahratta war, in which the Marquis of Wellesley displayed those talents for military and political combination which have rendered him illustrious. It was during the campaigns which ensued that General Arthur Wellesley defeated Holkar and the Bhonsla raja at Assaye, and General Lake won the victories of Farrukhabad, Dig, and Laswari over Sindhia and Holkar. The three confederates, Sindhia, Holkar,

and the Bhonsla, concluded peace with the British Government, after making large sacrifices of territory in favor of the victor, and submitting to British control politically. Thus the Mahratta empire was broken up. It was during these events that the British won the province of Orissa, the old Hindustan now known as the Northwestern Provinces, and part of the western coast comprising Gujerat.

The third collision came to pass between 1816 and 1818, through the conduct, not only of the confederates, but also of the peshwa himself. During the previous war the peshwa had been the protégé and ally of the British; and since the war he had fallen more completely than before under British protection and guidance, British political officers and British troops being stationed at his capital. He apparently felt encouraged by circumstances to rebel. Holkar and the Bhonslas committed hostile acts. The predatory Pindaris offered a formidable resistance to the British troops. So the peshwa ventured to take part in the combination against the British power, which even yet the Mahrattas did not despair of overthrowing. After long protracted menaces, he attacked the British at Kirki, but failed utterly, and fled a ruined man. Ultimately he surrendered to Sir John Malcolm, and was sent as a state prisoner to Bithûr, near Cawnpur. Thus the last vestige of the Mahratta empire disappeared. The British, however, released the raja of Sattara from the captivity in which he had been kept during the peshwa's time, and reinstated him on the throne. Owing to these events the British Government became possessed of the Concan and of the greater part of the Deccan.

It remains to mention briefly the fortunes of each remaining member of the once imperial confederation. The principality of Sattara was held to have lapsed in 1849 by the death of the raja without lineal heirs, and was annexed by the British Government. The Bhonsla raja of Nagpur and Berar was obliged to surrender Berar to the nizâm, as the ally of the British in 1803. Berar then remained under the nizâm till 1854, when it came under British administration, though it is still included in the nizâm's dominions. The raja of Nagpur died without lineal heirs in 1853, and his territory, being held to have lapsed, was annexed to the British territories. The house of Holkar has, during the last sixty years, remained faithful to its engagements with the British Government, and its position as a feudatory of the empire is well maintained. In Sindhia's territory, by reason of internal feuds, the British had to undertake measures which were successfully terminated after the battle of Maharajpur and Panniar in 1843. But on the whole the house of Sindhia has remained faithful. Sindhia himself was actively loyal during the war of the mutinies. The gaekwar gradually fell under British control toward the close of the last century, and his house has never engaged in hostilities with the British Government. The gaekwar Khande Rao signalized himself by loyalty during the war of the mutinies. His successor, Malhâr Rao, has recently been deposed by the British Government on account of gross maladministration. The ex-peshwa lived to old age at Bithûr, and died in 1851. His adopted son grew up to be the Nana Sahib, of infamous memory, who took a leading part in the war of the mutinies.

MAHZOR, or MAHAZOR, as some write the word, signifies a cycle. The term is used by the Jews in a threefold sense:—(1) astronomically, as *Mahzor Katan* for the cycle of nineteen years, *Mahzor Gadol* for that of twenty-eight years, *Mahzor Gadol lallebanah*, for the Metonic cycle; (2) liturgically, for the "Larger Prayer Book," whether in its narrower or its wider meaning (see below); and (3) ritually, for a book con-

taining religious laws and directions, as, for example, *Mahzor Vitri* by R. Simhah b. Shemuel of Vitri-le-Français, *Mahzor Rabbeni Tam* by R. Ya'akob b. Meir of Rameru, etc. In the first sense the plural is either *Mahazoroth*, or *Mahzorim*, or *Mahazorin*; in the second and third it is exclusively *Mahzorim*. As most ancient prayer-books contain more or less fully elaborate "tables," exhibiting calendar matter, in connection with the fixing of feasts and fasts and of the lessons from the Pentateuch and the Prophets, we cannot be in doubt as to the true cause of the application of the word *Mahzor* to the "Larger Prayer-Book." It is not applied because it is the equivalent of the Syriac *hudrâ*, as some think, but simply because *Mahzor* is the equivalent of the Greek *cyelos*.

The *Mahzor*, meaning prayer-book, is capable of division from different points of view. According to its contents we may divide it into two parts—the Smaller and the Larger. The Smaller *Mahzor* contains the ordinary prayers, together with the poetical insertions and the lessons from the Pentateuch and the Prophets used on the *Yamim Noraim*, or "Awe-inspiring Days" (i.e., New Year and the Day of Atonement), and those used on the *Yamin Tobim*, the three principal festivals (Passover, Pentecost, and Tabernacles). The Larger *Mahzor* is, indeed, the only one which really deserves this name, since it embodies the ordinary prayers, together with the poetical insertions for the whole year, and the lessons from the Pentateuch and the Prophets for all feasts and fasts and the other extraordinary occasions.

MAI, ANGELO, cardinal, well known as the discoverer and editor of numerous ancient texts, was born of humble peasant parentage at Schilpario, a mountain village in the province of Bergamo, Lombardy, on March 7, 1782. He died at Castelgandolfo, near Albano, on September 9, 1854, bequeathing his valuable private library at half its estimated value to the Vatican, the proceeds to be applied to the relief of the poor of his native village.

MAIA was the eldest and fairest of the Pleiades, the seven daughters of Atlas and the Oceanid Pleione. Her name marks her as the "fruitful mother;" and the seven sisters have no individuality except as the mothers of famous families. They were all born on Mount Cyllene in Arcadia, and are sometimes called mountain goddesses.

MAIDENHEAD, a municipal borough and market-town in Berkshire, England, in the diocese of Oxford, twenty-two and a half miles from London, thirteen and a half from Reading, and six from Windsor. The scenery around Maidenhead is extremely picturesque, and several noblemen's seats are in the neighborhood. Population in 1871, 6,173; in 1901 about 10,000.

MAIDSTONE, a municipal and parliamentary borough, and the county town of Kent, England, situated almost midway between London and Dover. The population has steadily increased during the present century; in 1801 it was 8,027; in 1901, 35,000.

MAIMANSINH, or MYMENSING, a district in the lieutenant-governorship of Bengal, India, with an area of 6,287 square miles. It is, for the most part, level and open, covered with well-cultivated fields, and intersected by numerous rivers. The census of 1901 returned the population of Maimansinh at 2,549,917.

MAIMBOURG, LOUIS, a French historical writer, was born at Nancy in 1610 and died in 1686.

MAIMONIDES. Among the great men to whom Mohammedan Cordova has given birth—and these are not a few—the greatest is unquestionably Rabbenu Mosheh b. Maimun Haddayyan.

"Rambam," or Maimonides, was born March 30,

1135, and died at Cairo, December 13, 1204; consequently he did not quite attain the age of seventy—a short space of life, when we take into consideration all the work he did for his contemporaries and all the works he left to posterity.

Like many other great and conscientious rabbis of all times, who consider it a sin to make of religious learning a means of gaining bread, Maimonides adopted the medical profession. That he must have greatly excelled in it is not merely known by the medical works he composed, but is best testified to by the fact that, although a Jew (and the times and the country he lived in were certainly not more tolerant than ours), he held the lucrative and important office of court-physician to Saladin of Egypt.

Maimonides was master of Greek-Arabic philosophy, as may be seen from his *Technical Terms of Logic*, his *Guide*, and his other works. That he was a mathematician and astronomer of no mean standing appears from the *Maamar Ha'ibbur* (calculations of the calendar, which he wrote at the age of twenty-two), the *Hilekhoth Kiddush Hahodesh* (in the book *Zemanim of the Mishneh Torah*), and the commentary on T. B., *Resh Hashshanah*. That he was a great Talmudist we know from his commentary on the *Mishnah* and his *chef-d'œuvre* the *Mishneh Torah*. That he was, as philosopher and theologian, a profound thinker, we know from his *Guide of the Perplexed* and his other works. To sum up in a few words the merits of Maimonides, we may say that, with all the disadvantages of the times in which he lived, he was the greatest theologian and philosopher the Jews ever produced, and one of the greatest the world has seen to this day. As a religious and moral character he is equaled only by a few and surpassed by none.

MAINE, a province of France, was bounded on the north by Normandy, on the west by Brittany, on the south by Anjou and Touraine, and on the east by Orléanais; along with the northern part of Anjou it is now represented by the departments of Sarthe and Mayenne. Together with a portion of Perche which was contiguous with it on the northeast, and the countship of Laval on the west, it constituted a great military government, of which Le Mans was the capital. The province suffered much during the wars of religion; its strong places were dismantled by Henry IV. and Richelieu. At the Revolution the troops of La Vendée entered Maine and took possession of Laval, Mayenne, and Le Mans at the end of 1793; after they had been defeated by the republican forces under Marceau and Westermann, their place was taken by the Chouans; and the pacification of the province, begun by General Hoche, was not completed until 1800. Toward the close of 1870 the second army of the Loire, retreating before the Prussians, was re-formed in Maine, and in the neighborhood of Le Mans one of the last great struggles in the Franco-German war took place in January, 1871.

* MAINE, the largest of the New England States in area, was formerly a part of Massachusetts, and was the fourth new State added to the original thirteen.

Description.—Maine is the northeasternmost State of the Union, and is bounded on the north by the Province of Quebec, Canada, from which it is divided partly by a mountain chain, partly by the St. John River, and partly by an arbitrary line; on the east by the Canadian Province of New Brunswick, from which it is divided by the St. Croix River, Schoodic Lake, and an arbitrary line; on the south by the Atlantic Ocean; and on the west by the State of New Hampshire, from which it is

divided chiefly by an arbitrary line. It extends from 43° 5' to 47° 35' north latitude, and from 66° 55' to 71° 5' longitude west from Greenwich. Its area is 29,895 square miles of land and 3,145 square miles of water. Its surface is highly variegated. The Atlantic coast is fringed with innumerable islands and deeply indented with bays, sounds and the estuaries of rivers, these affording a large number of fine harbors. From the coast the land soon rises to a considerable elevation. Indeed, only one-third of the area of the State is below 800 feet above tidewater. The southern part of the State is rolling and hilly, but affords much fine farming land. From the centre to the northern boundary the country is mountainous and rugged, and much of it still remains an almost unbroken wilderness. Lakes large and small are profusely scattered over the State, and a multitude of rivers flow from the mountain slopes. The scenery, ranging from pastoral to majestic, is scarcely surpassed in the world. Much of the State is still covered with primeval forests, of pine, spruce, hemlock, birch, and other trees. The chief minerals are granite, marble, and limestone, of which there are important quarries. There are mines, however, of copper, lead, manganese, and precious stones. The climate is eminently salubrious, but cool and in the north almost Arctic.

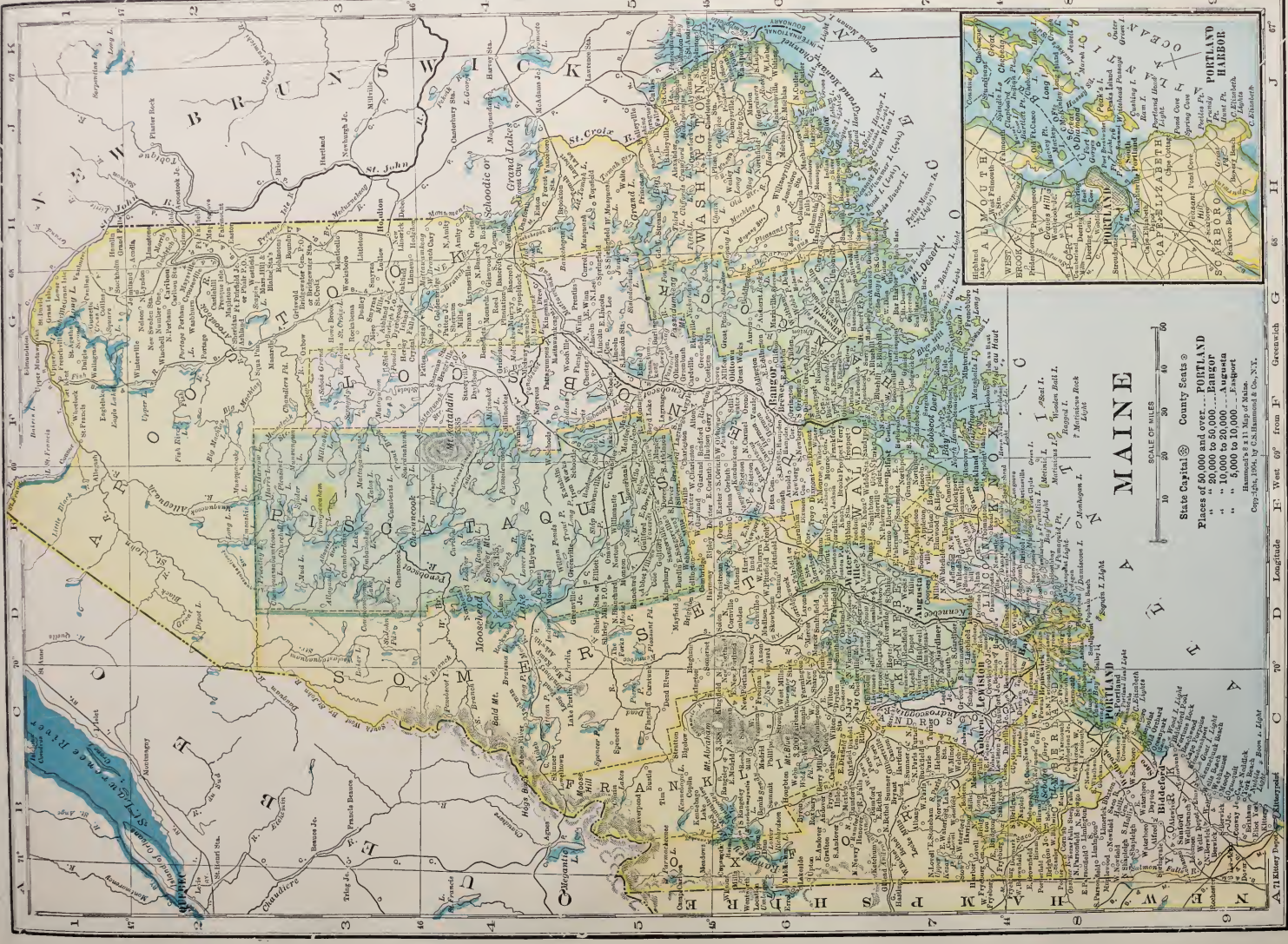
Resources and Products.—The mineral resources of the State have already been mentioned. Much of the land is unfitted for agriculture, but there is also much that is exceptionally fertile. The chief crops are grain of all kinds, hay, potatoes, and sweet corn. There are enormous apple orchards, which yield the finest of fruit. Live stock is extensively raised, some of the best strains of horses now coming from Maine. The yield of the forests is very great, for lumber, tanbark, paper-making pulp, etc. Vast quantities of ice are cut upon the rivers and lakes, for shipment to other States. The shores comprise valuable fishing grounds.

Industries.—In addition to the industries already indicated, Maine possesses extensive manufacturing establishments of many kinds. These include cotton and woolen mills, flour mills, paper mills, boot and shoe factories, foundries, lumber mills, canneries, and printing houses. Such industries are greatly facilitated by the practically unlimited water power furnished by such rivers as the Penobscot, Kennebec, and Saco. Various places on the coast, especially the city of Bath, have long been famous for their shipbuilding industries. The largest and best wooden vessels were built there years ago, and in later years the construction of iron and steel vessels has been undertaken with similar success.

Finance and Commerce.—Eighty-six national banks in the State of Maine had in 1902 loans and discounts amounting to \$27,856,703. The savings banks had 193,005 depositors, and \$72,082,694 deposits. The exchanges of the Portland clearing house were \$73,218,180. Little internal revenue is collected in Maine, because the manufacture of alcoholic liquors is prohibited. The foreign commerce of the State is considerable. In 1902 the exports in the two chief customs districts of Bangor and Portland amounted to \$18,573,448, and the imports to \$2,347,937. The State contains about 2,000 miles of railroads, including a Canadian line which traverses it from east to west. In the winter season many Canadian steamships make Portland their American terminal port.

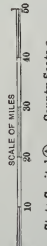
Education.—Maine is provided with an excellent system of free public schools. The school population, between 5 and 18 years in 1900 was 160,862, the school enrollment was 130,918, and the average attendance for a year of 141 days was 97,697. There were 6,445 teachers, and the salary list aggregated \$1,712,705. The 151 public high schools had 342 teachers and 8,519 scholars. Six normal schools had 35 teachers and 1,075 scholars.





MAINE

State Capital @ County Seats @
Places of 50,000 and over PORTLAND
" " 25,000 to 50,000 BANGOR
" " 10,000 to 25,000 AUBURN
" " 5,000 to 10,000 BANGOR
Hammond's & 11 Map of Maine.
Copyright, 1904, by Geo. Hammond & Co., N.Y.



The State contained four colleges, with 95 instructors and 1,073 students.

Government.—The capital of the State is Augusta. There are fourteen counties, greatly varying in size and population. The chief State officers are a Governor, Secretary of State, Treasurer, Adjutant-General and Attorney-General, elected for two years each; a Land Agent, and a Superintendent of Public Instruction, elected for three years each; and a Chief Justice, chosen for seven years. The Legislature, of two Houses, is chosen biennially. The Maine liquor law, prohibiting the manufacture or sale of intoxicating drinks, was one of the first of the kind enacted in the United States, and is famous under the name of the "Maine Law."

History.—The Maine coast was the scene of several of the earliest attempts to colonize the North American continent. The first comers were the Dutch, who did not succeed. The first English settlement was made in 1607, at the mouth of the Kennebec River, but was soon abandoned. A French colony was planted on Neutral Island in 1604, but was soon withdrawn. The first permanent settlement was made at Pemaquid, or Bristol, in 1625-30. In 1635 the region was granted by the British crown to Sir Ferdinando Gorges, who made his seat of government at York. In 1648 Pemaquid was made the capital of a "Ducal State," under the sovereignty of the Duke of York, but that organization did not long endure. In 1651 Maine was made a part of the colony of Massachusetts, and that connection was maintained until 1820, when, on March 3, Maine was admitted to the Union as a separate State. Until 1791 Maine was only about half its present size, the eastern portion, beyond the Penobscot River, belonging to New Brunswick. There were long and at times bitter disputes between the United States and England, at first over the ownership of eastern Maine and then over the northeastern boundary. The last of these was settled by treaty, on a compromise basis, in 1842. The subsequent history of the State has been marked with few striking incidents, excepting the enactment of the "Maine Law," and the "Greenback craze" which caused a temporary political revolution in 1878-9-80. The growth of the State in population has not been as rapid as that of some others, but the resources still undeveloped give ample encouragement for much future growth.

Population.—The population of Maine, at first as a Province belonging to Massachusetts and afterward as a State, has been as follows at the various decennial censuses:—

Year.	White.	Colored.	Total.
1790	96,002	538	96,540
1800	150,901	818	151,719
1810	227,736	969	228,705
1820	297,340	929	298,269
1830	398,263	1,192	399,455
1840	500,438	1,355	501,793
1850	581,813	1,356	583,169
1860	626,952	1,327	628,279
1870	625,309	1,606	626,915
1880	647,485	1,451	648,936
1890	659,896	1,190	661,086
1900	693,147	1,319	694,466

In 1790, while yet a Province of Massachusetts, Maine ranked eleventh in population, being larger than two of the thirteen original States. In 1800 and 1810 it ranked fourteenth. On admission to the Union in 1820 it ranked twelfth, and retained that rank in 1830. In 1840 it was thirteenth, in 1850 sixteenth, in 1860 twenty-second, in 1870 twenty-third, in 1880 twenty-seventh, and in 1890 and 1900 thirtieth.

It has always been on the whole a sparsely settled region. At the present time the southern and particularly southwestern parts are thickly settled, but vast expanses in the north are unoccupied save by hunters, fishermen and tourists. The density of population in 1790 was 3.2 to the square mile; in 1800, 5.1; in 1810, 7.7; in 1820, 10; in 1830, 13.4; in 1840, 16.8; in 1850, 19.5; 1860, 21; in 1870, 21; in 1880, 21.7; in 1890, 22.1; and in 1900, 23.2.

There has of late years been a considerable influx of foreigners into Maine, chiefly French Canadians. The numbers of native and foreign-born have been as follows for three decades:—

	1880.	1890.	1900.
Native.....	590,053	582,125	601,136
Foreign.....	58,883	78,961	93,330

The largest city in Maine is Portland, with 50,145 population in 1900, when it was the 78th city of the United States. No other place in the State had then as many as 25,000 inhabitants. W. FLETCHER JOHNSON.

MAINE DE BIRAN, FRANÇOIS-PIERRE-GONTHIER, a distinguished philosopher of France, the son of a physician, was born at Bergerac November 29, 1766. He died July 16, 1824.

MAINE-ET-LOIRE, a western department of France, consists of the southern portion of the former province of Anjou, and is bounded on the north by the departments of Mayenne and Sarthe, on the east by Indre-et-Loire, on the south by Deux-Sèvres and Vendée, on the west by Loire-inférieure, and on the northwest by Ile-et-Vilaine. The extreme length from northeast to southwest is about seventy-eight miles; the breadth from north to south ranges from twenty-five to fifty miles, and the area is 2,750 square miles. The population (1901) was 513,208.

MAINPURI, or **MYNPOOREE**, a district in the lieutenant-governorship of the Northwestern Provinces, India, has an area of 1,697 square miles, of which 949 are cultivated, and 190 cultivable. It consists of an almost unbroken level plain, intersected by small rivers, but unvaried by any greater elevations than a few undulating sand ridges. It is wooded throughout with mango groves, and isolated clumps of *bābul* trees occasionally relieve the bareness of its saline *usar* plains. On the southwestern boundary the Jumna flows in a deep alluvial bed, sometimes sweeping close to the high banks which overhang its valley, and at others leaving room for a narrow strip of fertile soil between the river and the upland plain. From the low-lying lands thus formed a belt of ravines stretches inland for some two miles, often covered with jungle, but affording good pasturage for cattle.

Mainpuri is one of the districts where the question of female infanticide has long engaged the attention of Government, and even as late as 1872 this practice was so common as in a great measure to account for the large preponderance of males in the general population. In 1842 measures were first introduced for the supervision of the Chauhán Rájputs and Phátak Ahírs, among whom the practice was most common. Every female birth had to be duly reported and authenticated, together with a subsequent report on the child's health. Illness had to be immediately announced to the police, who held an investigation. These rules remained in force until supplemented by those of the Infanticide Act of 1870. In 1843 there was not a single female child among these tribes; in 1847 there were but 299. In 1851 a convention of the heads of clans was held, when a body of rules was drawn up and subscribed to, but they were never observed. In 1865 a census of the Chauhán and Phátak villages was held, when six of the former were found without a single female infant. In some cases a daughter had never been known in the village. In 1870 it was found necessary to impose more stringent rules, and a special Infanticide Act was passed by the vice-regal council. Inquiries instituted in connection with the census of 1872 revealed the fact that many other tribes than the Chauháns and Phátaks were implicated

in the practice. In 1875, although a large proportion of the community had so far reformed in this respect as to be exempted from the special supervision provided by the Infanticide Act, there were still 276 villages on the "proclaimed list," under the surveillance of a specially organized police, maintained by a tax levied on the guilty communities.

In Mánpurí almost every acre of available soil is under tillage. The total area under cultivation at the date of the last settlement was 607,991 acres.

MAÍNPURÍ, the chief town and headquarters of the above district, had a population in 1901 of 24,117.

MAINTENON, FRANÇOISE D'AUBIGNÉ, MARQUISE DE, the second wife of Louis XIV., and unacknowledged queen of France for the last thirty years of his reign, was born in a prison at Niort on November 27, 1635. The Chevalier de Meré, a man of some literary distinction, who had made her acquaintance at Madame de Neuillant's, discovered her penniless condition, and introduced his "young Indian," as he called her, to Scarron, the famous wit and comic writer, at whose house all the literary society of the day assembled. The wit, who was of good legal family, and had a kind heart, took a fancy to the friendless girl, and offered either to pay for her admission to a convent, or, though he was deformed and an invalid, to marry her himself. She accepted his offer of marriage, and became Madame Scarron in 1651. For nine years she was not only his most faithful nurse, but an attraction to his house, where she tried to bridle the license of the conversation of the time. On the death of Scarron in 1660, Anne of Austria continued his pension to his widow, and even increased it to 2,000 livres a year, which enabled her to entertain and frequent the literary society her husband had made her acquainted with; but on the queen-mother's death in 1666, the king, in spite of all the efforts of her friends, refused to continue her pension, and she prepared to leave Paris for Lisbon as lady attendant to the queen of Portugal. But before she started, she met Madame de Montespan, who was already, though not avowedly, the king's mistress, at the Hôtel d'Albret, and the lady in question took such a fancy to her that she obtained the continuance of her pension, which put off forever the question of going to Portugal. Madame de Montespan did yet more for her, for when, in 1669, her first child by the king was born, Madame Scarron was established with a large income and a large staff of servants at Vaugirard to bring up the king's children in secrecy as they were born. In 1674, the king determined to have his children at court, and their governess, who had now made sufficient fortune to buy the estate of Maintenon, accompanied them. The king had now many opportunities of seeing Madame Scarron, and, though at first he was prejudiced against her, her even temper showed so advantageously against the storms of passion and jealousy exhibited by Madame de Montespan that she grew steadily in his favor, and had, in 1678, the gratification of having her estate at Maintenon raised to a marquise, and herself entitled Madame de Maintenon by the king himself. Such favors brought down the fury of Madame de Montespan's jealousy, and Madame de Maintenon's position was almost unendurable, until, in 1680, the king severed their connection by making the latter second lady in waiting to the dauphiness, and soon after Madame de Montespan left the court. The new "amie" used her influence on the side of decency, and the queen openly declared she had never been so well treated as at this time, and eventually died in Madame de Maintenon's arms in 1683. The queen's death opened the way to yet greater advancement; in 1684, she was made first lady in waiting to the dauphiness, and in

the winter of 1685, or, Voltaire says, in January, 1686, she was privately married to the king by Harlay, archbishop of Paris, in the presence, it is believed, of Père la Chaise, the king's confessor, the Marquis de Montchevreuil, the Chevalier de Forbin, and Bontemps. No written proof of the marriage is extant, but that it took place is nevertheless certain.

Her political influence has probably been overstated, but it was supreme in matters of detail. The ministers of the day used to discuss and arrange all the business to be done with the king beforehand with her, and it was all done in her cabinet and in her presence, but the king in more important matters often chose not to consult her. Such mistakes as, for instance, the replacing of Catinat by Villeroi may be attributed to her, but not whole policies—notably, according to Saint-Simon, not the policy with regard to the Spanish succession. Even the revocation of the edict of Nantes and the Dragonnades have been laid to her charge, but there can be no doubt that, in spite of ardent Catholicism, she retained a liking for her father's religion, and opposed, if not very vigorously, the cruelties of the Dragonnades. She was probably afraid to say much, or peril her great reputation for devotion, which had, in 1692, obtained for her from Innocent XII. the right of visitation over all the convents in France. Where she deserves blame is in her use of her power for personal patronage, as in compassing the promotions of Chamillart and Villeroi, and the frequent assistance given to her brother Comte Charles d'Aubigné. Her influence was on the whole a moderating and prudent force, and the king, when he wanted her advice, used to say, "Qu'en pensez vous Solidité?" or "Consultons la Raison." Her social influence was not as great as it might have been owing to her holding no recognized position at court, but it was always exercised on the side of decency and morality, and it must not be forgotten that from her former life she was intimate with the literary people of the day, and never deserted her old friends. Side by side with this public life, which wearied her with its shadowy power, occasionally crossed by a desire to be recognized as queen, she passed a nobler and sweeter private existence as the foundress of St. Cyr. The later years of her power were marked by the promotion of her old pupils, the children of the king and Madame de Montespan, to high dignity between the blood royal and the peers of the realm, and it was doubtless under the influence of her dislike for the Duc d'Orleans that the king drew up his will, leaving the personal care of his successor to the Duc de Maine, and hampering the Duc d'Orleans by a council of regency. On or even before her husband's death she retired to St. Cyr, and had the chagrin of seeing all her plans for the advancement of the Duc de Maine overthrown by means of the parlement of Paris. However, the regent Orleans in no way molested her, but on the contrary visited her at St. Cyr, and continued her pension of 48,000 livres. She spent her last years at St. Cyr, in perfect seclusion, but an object of great interest to all visitors to France, who, however, with the exception of Peter the Great, found it impossible to get an audience with her. On April 15, 1719, she died, and was buried in the choir at St. Cyr, bequeathing her estate at Maintenon to her niece, the only daughter of her brother Charles, and wife of the Maréchal de Noailles, to whose family it still belongs.

MAINZ, or MENTZ, the largest town in the grand-duchy of Hesse-Darmstadt, one of the strongest fortresses in Germany, and formerly the seat of an archbishop and elector, is situated on a rising ground on the left bank of the Rhine, nearly opposite the influx of the Main.

Mainz, one of the oldest cities in Germany, was originally a Celtic settlement. Its strategic importance was early recognized by the Romans, and in 13 B.C. Drusus, the son-in-law of Augustus, erected a fortified camp (*castrum*) there, to which a smaller *castellum* (the modern Castel) on the opposite bank was afterward added. The Celtic name became Latinized as *Maguntiacum* or *Moguntiacum*, and a town, *Maguntia*, gradually arose, which became the capital of Germania Superior. In the Thirty Years' War Mainz was occupied by the Swedes and the French. In 1792 it enthusiastically welcomed the principles of the French Revolution, and opened its gates to the Republican troops under General Custine. It was recaptured in the following year, but was ceded to France by the peace of Campo Formio in 1797. In 1814 it was restored to Germany and handed over to the grand-duchy of Hesse, remaining, however, a fortress of the German Confederation, garrisoned in common by Prussian, Austrian, and Hessian troops. Since 1871 it has been a fortress of the German Empire. Pop. (1901), 84,251.

MAISTRE, JOSEPH DE, diplomatist and polemical writer, was born at Chambéry, on April 1, 1754, and died at Turin on February 26, 1821.

Joseph de Maistre was one of the most powerful and by far the ablest of the leaders of the Neo-Catholic and anti-revolutionary movement. The most remarkable thing about his standpoint is that, layman as he was, it was entirely ecclesiastical. Unlike his contemporary Bonald, Joseph de Maistre regarded the temporal monarchy as an institution of altogether inferior importance to the spiritual primacy of the pope. He was by no means a political absolutist, except in so far as he regarded obedience as the first of political virtues, and he seldom loses an opportunity of stipulating for a tempered monarchy.

MAISTRE, XAVIER DE, the younger brother of Joseph, was born at Chambéry in October, 1763, and died at St. Petersburg on June 12, 1852.

MAITLAND, a town of Australia, in New South Wales, ninety-three miles north of Sydney, in the valley of Hunter river, and communicating with Newcastle and Port Hunter both by steamboat and railway. The inhabitants (1900) were 10,800, East Maitland having 3,500 and West Maitland 7,300.

MAITLAND, JOHN, earl and afterward duke of Lauderdale in the peerage of Scotland, born in 1614, was a great-grandson of Sir Richard Maitland (below). In early life a Presbyterian, he attended the Westminster Assembly in 1643 as an elder of the Church of Scotland, and he was a party to the surrender of Charles I. to the English army in 1645. Soon afterward, changing his politics, he became a zealous supporter of the royal cause, and promoter of the Engagement for raising forces for the king's rescue. He was taken prisoner at the battle of Worcester, and, on being set at liberty in 1660, he repaired to the Hague, and accompanied Charles II. to Scotland. From 1663 he was virtually ruler of Scotland—at first moderate in his counsels, but afterward severe in his measures against the Covenanters. In 1672 he was made duke of Lauderdale and a Knight of the Garter, and he had also an English peerage conferred on him (with the title of earl of Guildford) in 1674. He died in 1682.

MAITLAND, SIR RICHARD, an early Scottish lawyer and poet, was born in 1496, and died in 1586.

MAITLAND, WILLIAM, best known in Scottish history by the name of his father's estate of Lethington, near Haddington, where he resided, was the eldest son of Sir Richard Maitland, noticed above. Born about 1525, and partly educated in France; he was at an early age initiated into public life. He was made secretary

of state by Mary of Guise in 1558; but the favor with which he regarded the views of the reforming party soon exposed him to the queen mother's resentment. He became one of the "lords of the congregation," and was also one of the Scottish commissioners who negotiated with Queen Elizabeth regarding the terms on which she would agree to aid the reformers. Soon after Mary's arrival in Scotland, he was employed in two embassies to England, and was made first an extraordinary and then an ordinary lord of session. He had a controversy with Knox, whom he accused in the General Assembly of 1564 of teaching seditious doctrine. He went again to England as ambassador to notify the queen's marriage to Darnley, and was implicated both in the conspiracy against Rizzio and in the Kirk of Field tragedy, though he was also a member of the secret council at which the depositions of Darnley's murderers were taken, and signed the act of council accusing Mary of being the author of the crime. He fought against the queen at Langside, but at the conference at York identified himself in a measure with her interests. At the instance of the regent Murray he was arrested in 1569 as a participant in the king's murder, and would have been brought to trial but for a ruse of Kirkcaldy of Grange, who, as commander of Edinburgh Castle, conveyed him thither as a prisoner. The two principal representatives of Mary's cause, Lethington and Grange, who may be described as the forlorn hope of the captive queen, held the castle of Edinburgh for some time against the regent Morton and an English force; and when surrender became a matter of necessity they made their submission, not to the regent, but to the English queen. Kirkcaldy was executed; but Maitland died in prison, it was generally believed of poison administered by his own hand, on June 9, 1573.

MAITTAIRE, MICHEL, bibliographer and editor, was a native of France, and was born in 1668, dying in 1747.

MAIZE, or INDIAN CORN. See also Art. "AGRICULTURE," in these volumes. *Zea Mays*, L., is of the tribe *Phalarideæ* of the order *Gramineæ* or grasses. It is unknown in the native state, but is most probably indigenous to tropical America. Bonafous, however, quotes authorities as believing that it came from Asia, and maize was said by Santa Rosa de Viterbo to have been brought by the Arabs into Spain in the thirteenth century. A drawing of maize is also given by Bonafous from a Chinese work on natural history, *Li-chi-tchin*, dated 1562, a little over sixty years after the discovery of the New World. It is not figured on Egyptian monuments, nor was any mention made of it by Eastern travelers in Africa or Asia prior to the sixteenth century. On the authority, however, of Mr. J. Crawford, who resided for nine years in Java, Bonafous says it had been cultivated from a very ancient period in the Asiatic islands, under the equator, and that it was received thence into China, and so passed westward into India and Turkey, hence its name of "Turkey-corn," under which title Gerard, in 1597, figured and described seven kinds, as well as one called "Corne of Asia." Both Gerard and Bonafous think that it first came from the East, but that on the discovery of America it was reintroduced into Europe from that country. Humboldt and others, however, do not hesitate to say that it originated solely in America. It had been long and extensively cultivated there at the period of the discovery of the New World. The plant is monoecious, producing the staminate (male) flowers in a large feathery panicle at the summit, and the (female) dense spikes of flowers, or "cobs," in the axils of the leaves below, the long pink styles hanging out like a silken tassel. They are invested by the sheaths of

leaves, much used in packing oranges in South Europe, and the more delicate ones for cigarettes in South America and Mexico.

Usually the sheaths terminate in a point, the blades being arrested. More than 300 varieties are known, which differ more among themselves than those of any other cereal. Some come to maturity in two months, others require seven months; some are as many feet high as others are inches; some have kernels eleven times larger than others. They vary similarly in shape and size of ears, color of the grain, which may be white, yellow, purple, striped, etc., and also in physical characters and chemical composition—in short, in all those characters in which the different species of a genus differ among themselves. The varieties grown most abundantly in the United States may be roughly grouped into four great classes. The "Flint" varieties are most common east of Lake Erie and north of Maryland, and the "Dent" varieties are the common ones west and south of these points. The "Horsetooth" varieties are grown extensively only in the south, and there they are grown along with the dent. These three classes pass into each other by every gradation, and the grain from all is similar in chemical composition. The "Sweet" varieties are not grown for the ripe grain, but for boiling corn, and that the stalks may serve as "corn-fodder." "Green corn" was an important food with the native Indians. Many of the tribes celebrated its season with religious ceremonies and festivals. In the large cities of America "green corn" is a table luxury, but in the smaller towns and country districts it is an important article of food. Chemical analysis, as well as common experience, shows that this is a very nutritious article of food, being richer in albuminoids than any other cereals when ripe (calculated in the dry weight). It is capable of being grown in the tropics from the level of the sea to a height equal that of the Pyrenees, and in the south and middle of Europe, but it cannot be grown in England with any chance of profit, except perhaps as fodder. Frost kills the plant in all its stages and all its varieties; and the crop does not flourish well if the nights are cool, no matter how favorable the other conditions. Consequently it is the first crop to disappear as one ascends into the mountain regions, and comparatively little is grown west of the great plains of North America. It prefers a deep, rich, warm, dry, and mellow soil, and hence the rich bottoms and fertile prairies of the Mississippi basin constitute the region of its greatest production. In 1890 there was a total of more than 70,000,000 acres devoted to the growth of maize in the United States, the production being 1,489,970,000 bushels, valued at \$754,433,451. This is a great falling off both in acreage and production from the phenomenal growth of 1888 and 1889, but on the other hand the value of the marketable product was much increased, and the same was true of the year 1891.

As an article of food, maize is one of the most extensively used grains in the world. Although rich in nitrogenous matter and fat, it does not make good bread. A mixture of rye and corn meal, however, makes an excellent coarse bread, formerly much used in the Atlantic States, and a similar bread is now the chief coarse bread of Portugal and some parts of Spain. When the harder "flint" varieties are roasted, the grains "pop," the skin bursts, and the white interior swells up, emitting a pleasant odor. It is either baked into cakes called *tortillas* by the Indians of Yucatan, or made into a kind of porridge, as in Ireland. When deprived of the gluten it constitutes *oswego*, *maizena*, or corn flour. Maize contains more oil than any other cereal, ranging from 3.5 to 9.5 per cent. in the com-

mercial grain. This is one of the factors in its value for fattening purposes. In distilling and some other processes this oil is separated and forms an article of commerce. When maize is sown broadcast or closely planted in drills, the ears may not develop at all, but the stalk is richer in sugar and sweeter, and this is the basis of growing "corn-fodder." The amount of forage that may be produced in this way is enormous; 50,000 to 80,000 pounds of green fodder are grown per acre, which makes 8,000 to 12,000 pounds as field-cured. Sugar and molasses have from time to time been manufactured from the cornstalks, but at present this manufacture is not commercially successful.

In the treeless western prairies maize is often used as fuel, as in many places fuel can be procured so cheaply in no other way. A hundred bushels of ears is equal in heating power to a cord of the best hard wood, and may be grown for a price less than a cord of hard wood brings in the large cities. The use of corn in the industries, as the raw material for the manufacture of alcohol, whisky, starch, glucose, oil, and various food products, increases year by year, with the increase of facilities for production and the increasing applications of chemistry to the arts.

The estimates of the crop of 1900 in the United States are as follows:

STATES AND TERRITORIES.	BUSHEL.	VALUE.
Maine.....	645,040	\$ 326,824
New Hampshire.....	1,080,720	538,738
Vermont.....	2,324,450	1,180,595
Massachusetts.....	1,539,980	771,277
Rhode Island.....	288,220	164,138
Connecticut.....	1,931,510	994,885
New York.....	20,024,865	9,181,791
New Jersey.....	10,978,800	4,533,473
Pennsylvania.....	51,869,780	21,896,795
Delaware.....	1,736,580	1,725,452
Maryland.....	19,766,510	7,462,594
Virginia.....	36,748,410	16,233,756
North Carolina.....	34,818,860	17,394,407
South Carolina.....	17,429,610	9,149,808
Georgia.....	34,032,230	17,155,868
Florida.....	5,311,050	2,669,590
Alabama.....	35,953,047	17,082,751
Mississippi.....	38,789,920	18,873,934
Louisiana.....	22,062,580	10,327,723
Texas.....	109,979,350	34,424,871
Arkansas.....	44,144,908	17,572,170
Tennessee.....	67,307,390	28,059,508
West Virginia.....	16,610,730	7,698,335
Kentucky.....	73,974,220	29,423,996
Ohio.....	152,955,530	48,037,895
Michigan.....	44,584,130	17,798,011
Indiana.....	178,967,070	51,752,946
Illinois.....	398,149,140	115,092,567
Wisconsin.....	53,309,810	11,995,822
Minnesota.....	67,256,020	11,337,105
Iowa.....	385,453,190	97,297,707
Missouri.....	208,844,870	61,246,305
Kansas.....	229,937,430	58,076,738
Nebraska.....	210,974,740	51,251,213
California.....	1,477,993	700,894
Oregon.....	359,523	155,693
Colorado.....	1,275,680	508,488
North Dakota.....	1,284,870	397,278
South Dakota.....	32,402,540	7,263,127
New Mexico.....	677,305	419,936
Utah.....	250,020	121,872
Washington.....	218,706	104,263

MAJLATH, JANOS or JOHN, COUNT, Hungarian historian and poet, was born at Pest on October 5, 1786. He suicided in 1855.

MAJOLICA. See POTTERY.

MAJOR, or MAIR, JOHN, a theological and historical writer, was born at the village of Cleghorn, near

North Berwick, Scotland, about the year 1470, and died in 1550.

MAJORCA. See **BALEARIC ISLANDS.**

MAJORIANUS, JULIUS VALERIUS, emperor of the West from 457 to 461, was the successor of Avitus. He had been a distinguished soldier under Aetius, and also after the death of that general; for his election to the purple he was indebted to the powerful Count Ricimer, patrician of Rome. To put a stop to the harassing incursions of the Vandals he, in 458, resolved to lead an expedition against Genseric himself; for this purpose he got together a large army, composed chiefly of barbarians, and, passing the Alps in November, 458, made Lyons, and afterward Arles, his headquarters until the preparations for the invasion of Africa had been completed. Having during his stay in Gaul succeeded in pacifying Theodoric, he, in the beginning of 460, crossed the Pyrenees for the purpose of joining his armament at Carthage. Genseric, however, after all overtures for peace had been rejected, succeeded through the treachery of certain officers in surprising the Roman fleet, most of the ships being either taken or destroyed. Majorianus returned at once to Gaul, where he made peace with Genseric in the following year. Soon afterward, while at Tortona in Lombardy, he was surrounded by partisans of Ricimer, and compelled to abdicate (August 2, 461). He died, most probably by violence, five days afterward, and was succeeded on the throne by Severus.

MAKALLÁ, or MACULLA, a port on the south coast of Arabia. The town, which appears to be of no great antiquity, is described by Wellsted as built on a low projecting point, with many lofty and substantial houses, and a suburb of huts, chiefly inhabited by slaves, Somalis, and Arab sailors, on the slopes leading up to a lofty chalk-hill which overhangs the town.

MAKKARÍ. Abu'l-'Abbás Ahmed ibn Mohammed el-Makkari, Arabic historian, was born at Tilimsán (Tlemcen) in Algeria, toward the close of the sixteenth century. In 1628 he came to Damascus after a pilgrimage to Jerusalem. Warmly received by the scholars there, he delivered lectures on the traditions of the Prophet, and in the evenings entertained his friends with stories of the glories of Moslem Spain, a subject of interest to all Arabs, and especially to those of Syria. His friends made him promise to reduce his narrative to writing, and on returning to Cairo he devoted three years to this task. He had divorced his wife and made other preparations to settle definitely in Damascus when death overtook him in 1631.

MAKÓ, a corporate town of Hungary, and capital of the trans-Tisian county of Csanád, is situated near the right bank of the Maros, about fifteen miles east-southeast of Szeged. Pop. (1900), 33,722.

MAKRÍZÍ. Takí el-Dín Ahmed ibn 'Alí el Makrizí one of the most meritorious of Arabic historians and archaeologists, was born in Cairo, in 1364, and spent his life mainly in Egypt, where he was brought up as clerk in a government office, and at a later date he became *Mohlesib* (a sort of police officer in charge of the markets) for Cairo and northern Egypt, and afterward inspector of the Kalánesí foundation at Damascus. Makrizí's literary activity was very great; he was not a man of original power, and his books are largely compilations, in which he is not always scrupulous in naming the sources to which he is indebted, but his learning was vast, his observation accurate, and his judgment sagacious. His most important work is the historical and topographical description of Egypt. Died, 1441.

MALABAR, a district in the Madras presidency, India. The extreme length is 145 miles, while the breadth varies from twenty-five miles in the north to

seventy miles in the south; the area is 5,763 square miles.

MALACCA. The town of Malacca lies on the southwest coast of the Malay Peninsula. It is situated on a small river bearing its name, which separates it into two parts. That on the right bank is occupied by the old Dutch town, and that on the left by the business quarter, which is connected with the former by a small bridge, and is chiefly inhabited by Chinese and native traders. Pop. of settlement (1901), 95,487.

MALACHI. According to the title the last book of minor prophets contains the word of Jehovah to Israel by the hand of Malachi. The word may either be an adjective, "angelic," or may signify "the angel (messenger) of Jehovah." In either case it seems a strange (though hardly an impossible) name for a man to bear, and from the time of the Septuagint, which translates "by the hand of His messenger," it has often been doubted whether Malachi is the real name of the author, or only an epithet assumed by himself or attached by the collector to a work which he found anonymous, with reference to iii. 1. A Hebrew tradition given in the Targum of Jonathan, and approved by Jerome, identifies Malachi with Ezra the priest and scribe, but, though this opinion is ingeniously supported by a reference to ii. 7, where the priest and custodian of the law is called the messenger of Jehovah of hosts, it is unlikely that Ezra's name would have been lost had he been the real author.

MALACHITE, an ore of copper, presenting in its finer varieties a beautiful green color which has led to its use as an ornamental stone. It is chemically a hydrated basic carbonate of copper, and appears to have been formed in most cases by the action of meteoric agencies on native copper, red oxide of copper, copper pyrites, and other ores. Upon these minerals the malachite frequently forms an incrustation. Although occasionally found in crystals belonging to the monoclinic system, its usual mode of occurrence is in the stalactitic and stalagmitic forms—frequently with a globular, botryoidal, or mammillated surface; while in other cases it forms compact and even earthy masses. The stalactitic varieties display, when fractured, a beautiful internal structure, being made up of concentric zones of light and dark tints; and it is upon this structure that much of the beauty of polished malachite depends. The colors include various shades of apple-green, emerald-green, and verdigris-green. Malachite is a mineral of very wide geographical distribution, being found more or less abundantly in the upper part of most deposits of copper ore. The finer varieties, such as lend themselves to purposes of ornament, are, however, found only in Siberia, in Australia, and at Bembe on the west coast of Africa.

MALACHY, ST., otherwise known as Maelmaedog Ua Morgair, for some time archbishop of Armagh, and afterward papal legate in Ireland, was born of noble parentage at Armagh about the year 1094. When thirty years of age he was chosen and consecrated bishop of Connor; after the sack of that place by the king of Ulster he withdrew into Munster and built the monastery of Ibrac. Meanwhile he had been designated by Celsus (in whose family the see of Armagh had been hereditary for many years) to succeed him in the archbishopric. Having finally settled the diocese, he, as had been previously stipulated by himself, was permitted to return to his former diocese. In 1139 he set out from Ireland with the purpose of soliciting from the pope the pallium for the archbishop of Armagh; on his way to Rome he visited Clairvaux, and thus began a life-long friendship with St. Bernard, who survived to write his biography. Malachy was received by Innocent II. with great honor, and made legate in Ireland, though

he did not at once obtain the pallium. For the next eight years after his return from Rome Malachy was active in the discharge of his legatine duties, and in 1148 he received from the bishops of Ireland a commission to return to Rome and make fresh application for the pallium; he did not, however, get beyond Clairvaux, where he died on November 2, 1148.

MALAGA, a maritime province of Spain, one of the eight modern subdivisions of Andalusia, is bounded on the west by Cadiz, on the north by Seville and Cordova, on the east by Granada, and on the south by the Mediterranean, having an area of 2,823 square miles, and a population of 485,132. The rise from the sea is rapid, and the average elevation of the province is considerable. Though the methods of agriculture are for the most part rude, the yield of wheat in good seasons is considerably in excess of the local demand; and large quantities of grapes and raisins, oranges and lemons, figs, and almonds, are annually exported. The oil and wines of Malaga are also highly esteemed; and in recent years, especially since the phylloxera invasion, the growth of the sugar-cane has developed into a considerable industry.

MALAGA, the capital of the above province, and, next to Barcelona, the most important seaport of Spain, is finely situated on the Mediterranean coast, at the southern base of the group of hills known to history as the Axarquia, and at the eastern extremity of the fertile vega of Malaga. The population in 1897 was 125,579. The trade of the port is chiefly in the products of the province—lead, wine, raisins, oranges, lemons, figs, and esparto being the staples.

MALARIA, an Italian colloquial word (*mala*, bad, and *aria*, air), introduced into English medical literature by Macculloch (1827) as a substitute for the more restricted terms marsh miasm or paludal poison. By very general consent the word is understood to mean an actual poisonous substance existing as a separate entity, and giving rise to the definite unhealthy condition of body known by a variety of names, such as ague, intermittent (and remittent) fever, marsh fever, jungle fever, hill fever, "fever of the country," and "fever and ague." By a figure of speech, the name of malaria is often applied to the disease itself; strictly speaking, the effects on the human body are "malarial fever," or manifestations of the "malarial process." The existence of a specific malaria-poison is a pure hypothesis; and it has been attempted by a respectable minority to dispense with the hypothesis of an actual poisonous agent, and to find the cause of intermittents and remittents in the excessive and sudden abstraction of heat through damp and cold after sunset from the bodies of individuals who had previously endured great solar heat. In either view, the unknown cause of ague is denoted with sufficient etymological accuracy by the word malaria.

A single paroxysm of simple ague is much the same in all countries, temperate, subtropical, or tropical. It may come upon the patient in the midst of good health, or it may be preceded by some *malaise*. The ague-fit begins with chills proceeding as if from the lower part of the back, and gradually extending until the coldness overtakes the whole body. Tremors of the muscles, more or less violent, accompany the cold sensations, beginning with the muscles of the lower jaw (chattering of the teeth), and extending to the extremities and trunk. The expression has meanwhile changed; the face is pale or livid; there are dark rings under the eyes, the features are pinched and sharp, and the whole skin shrunken; the fingers are dead white, and the nails blue. All those symptoms are referable to spasmodic constriction of the small surface arteries, the pulse at the wrist being itself small, hard, and quick. In the inte-

rior organs there are indications of a compensating accumulation of blood, such as swelling of the spleen, engorgement (very rarely rupture) of the heart, with a feeling of oppression in the chest, and a copious flow of clear and watery urine from the congested kidneys. The body temperature will have risen suddenly from the normal to 103° or higher. This first or cold stage of the paroxysm varies much in length; in temperate climates it lasts from one to two hours, while in tropical and subtropical countries it may be shortened. It is followed by the stage of dry heat, which will be prolonged in proportion as the previous stage is curtailed. The feeling of heat is at first an internal one, but it spreads outward to the surface and to the extremities; the skin becomes warm and red, but remains dry; the pulse becomes softer and more full, but still quick; and throbbings occur in exposed arteries, such as the temporal. The spleen continues to enlarge; the urine is now scanty and high-colored; the body temperature still rises (up to 104° or 105° or even higher); there is considerable thirst; and there is the usual intellectual unfitness, and it may be confusion, of the feverish state. This period of dry heat, having lasted three or four hours or longer, comes to an end in perspiration, at first a mere moistness of the skin, passing into sweating that may be profuse and even drenching. Sleep may overtake the patient in the midst of the sweating stage, and he awakes, not without some feeling of what he has passed through, but on the whole well, with the temperature fallen almost or altogether to the normal, or it may be even below the normal, the pulse moderate and full, the spleen again of its ordinary size; the urine that is passed after the paroxysm deposits a thick brick-red sediment of urates. The three stages together will probably have lasted six to twelve hours. The paroxysm is followed by a definite interval in which there is not only no fever but even a fair degree of bodily comfort and fitness; this is the intermission of the fever. Another paroxysm begins at or near the same hour next day (quotidian ague), or the interval may be forty-eight hours (tertian ague), or seventy-two hours (quartan ague). It is the general rule, with frequent exceptions, that the quotidian paroxysm comes on in the morning, the tertian about noon, and the quartan in the afternoon. Another rule is that the quartan has the longest cold stage, while its paroxysm is shortest as a whole, the quotidian has the shortest cold stage and a long hot stage, while its paroxysm is longest as a whole. The point common to the various forms of ague is that the paroxysm ceases about midnight or early morning. Quotidian intermittent is on the whole more common than tertian in hot countries; elsewhere the tertian is the usual type, and quartan is only occasional.

If the first paroxysm should not cease within the twenty-four hours, the fever is not reckoned as an intermittent but as a remittent.

Remittent is a not unusual form of the malarial process in tropical and sub-tropical countries, and in some localities or in some seasons it is more common than intermittent. It may be said to arise out of that type of intermittent in which the cold stage is shortened while the hot stage tends to be prolonged. A certain abatement or remission of the fever takes place, with or without sweating, but there is no true intermission or interval of absolute apyrexia. The periodicity shows itself in the form of an exacerbation of the still continuing fever, and that exacerbation may take place twenty-four hours after the first onset, or the interval may be only half that period, or it may be double. A fever that is to be remittent will usually declare itself from the outset; it begins with chills, but without the shivering and shaking fit of the intermittent; the hot stage soon fol-

lows, presenting the same characters as the prolonged hot stage of a quotidian, with the frequent addition of bilious symptoms, and it may be even of jaundice and of tenderness over the stomach and liver. Toward morning the fever abates; the pulse falls in frequency, but does not come down to the normal; headache and aching in the loins and limbs become less, but do not cease altogether; the body temperature falls, but does not touch the level of apyrexia. The remission or abatement lasts generally throughout the morning; and about noon there is an exacerbation, seldom ushered in by chills, which continues till the early morning following, when it remits or abates as before. A patient with remittent may get well in a week, under treatment, but the fever may go on for several weeks; the return to health is often announced by the fever assuming the intermittent type, or in other words, by the remissions touching the level of absolute apyrexia. Remittent fevers (as well as intermittents) vary considerably in intensity; some cases are intense from the outset, or pernicious, with aggravation of all the symptoms—leading to stupor, delirium, collapse, intense jaundice, blood in the stools, blood and albumen in the urine, and, it may be, suppression of the urine followed by convulsions. The severe forms of intermittent are most apt to occur in the very young, or in the aged, or in debilitated persons generally. Milder cases of malarial fever are apt to become dangerous from the complications of dysentery, bronchitis, or pneumonia. Severe remittents (pernicious or bilious remittents) approximate to the type of yellow fever, which is conventionally limited to epidemic outbreaks in western longitudes and on the west coast of Africa. Blood in the urine has been described by several recent writers as distinctive of a form of bilious remittent occurring at a number of malarious localities in the tropical zone of both hemispheres. The remittent type occurs wherever and whenever the malarial conditions are severe; when it has appeared in colder climates, it has usually been at the height of an epidemic of intermittent. With all the foregoing statements, it should be borne in mind that anomalies are frequent.

Of the mortality due to malarial disease a small part only is referable to the direct attack of intermittent, and chiefly to the fever in its pernicious form. Remittent fever is much more fatal in its direct attack; it often kills in the first few days, according to its initial intensity or the severity of the complications. But probably the greater part of the enormous total of deaths set down to malaria is due to the *malarial cachexia*. The malarial cachexia may be either the sequel of one or more actual attacks of fever, or it may arise insidiously in those who inhabit a malarious district and have never experienced the sharp paroxysms of fever. In the latter case, malaria is almost as much an ethnological as a pathological factor. The dwellers in a malarious region like the Terai (at the foot of the Himalayas) are miserable, listless, and ugly, with large heads and particularly prominent ears, flat noses, tumid bellies, slender limbs, and sallow complexions; the children are impregnated with malaria from their birth, and their growth is attended with aberrations from the normal which practically amount to the disease of rickets. The malarial cachexia that follows definite attacks of ague consists in a state of ill-defined suffering, associated with a sallow skin, enlarged spleen and liver, and sometimes with dropsy.

Nearly allied to the malarial cachexia is the so-called state of *masked ague*. Many common ailments have been set down to malaria, without sufficient reason; but there is hardly any doubt that intermittent paroxysms of *neuralgia*, especially of the supra-orbital nerve (*brow-ague*) and of the infra-orbital (*tic douloureux*), are often

malarial in origin. These non-febrile effects are apt to follow exposure to malaria; they occur (not exclusively) in those who have had fever and ague; they are sometimes accompanied by suggestions of the cold, and hot, and sweating stages of the true paroxysm; and they often yield to the great anti-malarial remedy, quinine. Such patients have the general ill-health and suffering, as well as the pallor, of the malarial cachexia.

The morbid anatomy of malarial fevers is chiefly confined to congestions and enlargements (with textural changes) of the spleen and liver. One of the most salient pathological facts is the occurrence of black pigment in the blood, and deposits of it in the spleen, liver, and other parts. The malarial process sometimes leads to ulcerations and sloughing of the mucous membrane of the great intestine, not distinguishable from those of dysentery. The malarial fever of Rome is often associated with more or less of swelling and, it may be, even ulceration of the lymphatic follicles of the small intestine, as in typhoid fever; the same anatomical condition was associated with much of the malarial fever of the American Civil War (typho-malaria).

Malaria has been estimated to produce one-half of the entire mortality of the human race; and, inasmuch as it is the most frequent cause of sickness and death in those parts of the globe that are most densely populated, the estimate may be taken as at least rhetorically correct.

There have been numerous historical epidemics of intermittent and remittent fever, from that of 1557-58 (which spread over all Europe) down to that of 1872, which prevailed simultaneously in Europe, North America, and southern India. The epidemic or pandemic prevalence of intermittent and remittent fever in certain years probably finds its explanation in the meteorology of those years, but no uniform law has been discovered. Whenever malaria has settled epidemically in a new locality, there had been epidemics coming and going for some time previously.

Malarious Localities.—The most malarious localities are the deltas and estuaries of rivers (Ganges, Euphrates, Po, Mississippi, Orinoco), low-lying country that is apt to be inundated (Danubian states), tropical or sub-tropical forests in which there is a moist atmosphere, with stagnation of the air and rank vegetation (jungles), tracts of land that have been cleared of trees and have gone out of cultivation, being in more cases dry than wet (Roman Campagna, Tuscan Maremma, many parts of Persia, Asia Minor, and North Africa, including the sites of ruined cities), inland swamps and marshes (Pontine Marshes), and situations on the coast where the tidal and fresh water join to form brackish marshes (mangrove swamps of the West Indian, Central American, Brazilian, and West African coasts). The mangrove is associated with the most pestilential localities; it springs "like a miniature forest out of the greasy mud-banks, the bright green color of the bushes reminding one of the rank grass in a churchyard" (C. Darwin). In all those localities there is a soil, usually wet but sometimes dry, rich in the products of vegetable decay; the soil has either been deposited by rivers and tides, or it has formed on the spot out of the undisturbed accumulation of decaying vegetation season after season over a long period. There is, however, a second great class of malarious localities, distinguished by characters that are to some extent the opposite of the foregoing. These are barren rocks (Ionian Islands, Hong Kong, parts of Baluchistan, De Los Islands near Sierra Leone); high table-lands more or less barren (Deccan, Mysore, Persia, New Castile); mountainous regions (Andes, Rocky Mountains); prairies of North America and savannas of Venezuela and Brazil; sandy

plains (North Africa, Rajputana, Sindh). A somewhat exceptional locality for malaria is on board ship at sea; there are several well-authenticated instances of epidemic outbreaks at sea, in most cases referred to the putrid bilge-water, and in one case to a cargo of wet deals from the Baltic.

There are several localities whose exemption from malaria has been thought remarkable. Among these, Singapore has long been noted; other instances are the Amazon (as compared with its tributaries and with the Orinoco), the pampas of the La Plata and the Parana, marshy parts of Australia, New Zealand, and New Caledonia, and the marshy Bermudas. The explanation given of the exemption of Singapore, where many of the supposed malarial conditions are present, is that the range of temperature (diurnal and annual) is small; the explanation for the Amazon is that a wind constantly blows up the river from the sea (not reaching the side streams), which serves to equalize the day and night temperature and to obviate the nocturnal radiation of heat.

Malarious Seasons.—In temperate climates autumn is the season when malaria prevails most. "In the autumn, and after the harvest has been gathered, when the ground is covered with its debris, when the rain falls in torrents, and when the solar heat has acquired its greatest intensity, all the conditions of greatest quantity of vegetable matter, of moisture, and of highest temperature are united, so that the season which realizes the hopes of the husbandman is the period of pestilence and of his greatest danger" (R. Williams). In the equatorial regions of the East Indies, Africa, and America, the rainy season (May to July or August) is most unhealthy, and especially the time of commencement of the rains and the time of cessation; on the west coast of Africa the months of February, March, and April, which are the hottest months of the year, are at the same time the most healthy. But while autumn and the time of the rains are the malarious season for those localities that are distinguished by wet soil, rank vegetation, etc., it is summer, or the time of extreme heat and drought, that is the unhealthy season for the localities distinguished by dryness of the soil and often by barrenness. The hill fever of the Deccan and Mysore is often most prevalent and most severe in the hottest and driest seasons; in Algeria there is most fever when the country is parched to a desert. The malarial season in the Tuscan Maremma is from June to the middle of September. In military experience it has frequently happened that malaria has attacked the troops in the hottest weather after camping in the dried-up water-courses of uplands, or in parched meadows and sandy levels that are apt to be flooded only in winter.

Conditions of Origin.—In all localities and at all seasons, it is at or after sunset that the malarial influence prevails, and it tells most when a cold night follows a hot day. Perhaps the most constant fact relating to malaria is that it goes with watery exhalations and with the fall of dew. On wet soils, and over marshes, swamps, and jungles, the aqueous vapor condenses as the air cools; while on dry surfaces the rapid radiation of heat causes a heavy dew-fall. The occurrence of malaria on bare rocks, parched uplands, and treeless tracts of dry fallow land may have several associated circumstances; but that which has been most uniformly observed in such localities is great diurnal range of temperature, with rapid radiation of heat after sunset, and copious fall of dew. The "hill fever" of Mysore occurs among bare rocks and stones and brown earth; at the hottest season (March to June) the diurnal range of the shade temperature may be 20° to 30°, while the rocks in the sun may show a surface temperature up to 220°, and undergo a rapid cooling

after sunset. The most malarious locality at all times of the year on the Orinoco is around the great cataract, where the banks of the river for some distance are covered with bare black rocks piled to a considerable height; the rocky substance and the black surface combine to produce the greatest absorption of heat and the most rapid radiation, and the rocks there, as well as in other parts of South America and in India, are credited by the natives with giving off poisonous exhalations which cause the fever. Among the conditions of origin the predisposition of the human subject takes a prominent place. Those who have been habituated to extreme heat, and are on occasion exposed to cold and damp, are likely to acquire intermittent or remittent fever; and those who are poorly clad, housed, and fed are most likely. Fires at night in a malarious locality are a well-known protection from fever; the cover of trees (preventing the radiation of heat) is also a protection. Those who have ague before are liable to have it again on exposure in a malarious locality, or to chill anywhere.

Diffusion of Malaria.—On the hypothesis that malaria is a poisonous substance, it is permissible to speak of its diffusion. It acts for the most part only within a few feet of the ground; in the East Indies the raising of dwellings on piles serves to keep off, or at least lessen, the liability to fever, and the Indians of South America escape it by sleeping in the branches of trees. Although it is not known to act beyond a few feet from the earth's surface, it may produce fever in localities situated at a height of 7,000 or 9,000 feet above the sea-level. It sometimes acts at a distance from its supposed place of origin. Thus, it is said to have caused fever on board ships lying two or three miles off a malarious shore, although it is more usual for ships at even a short distance from the shore to escape. In West Indian experience it has been known to render the high limestone ridge more unhealthy than the swamp at its foot, and a similar experience has occurred on the Kentish shore of the Thames estuary, and at other parts of the English (Channel) coast. There are instances where it has, so to speak, traveled along a narrow valley from an unhealthy marsh to a salubrious situation. Although a still night is most favorable to its production, there is a popular opinion that it is carried by the wind. In many malarious localities there is a definite "ague line," beyond which the noxious influence is not felt. A belt of trees, or even a wall, will "keep it off." It clings to those surfaces that are most easily bedewed. Situations to windward of a malarious swamp are usually reckoned safe.

Hypothesis of Malaria.—Malaria is known only by its effects on the animal body; the effects, although they vary much in intensity, are uniform, definite, or specific, and are characterized by a truly remarkable periodicity. The oldest and most prevalent hypothesis of malaria is that it is a specific poison generated in the soil. Perhaps not every soil is capable under circumstances of causing malaria, but it is difficult to assign limits to its potential presence. There are seemingly well-authenticated cases of malarial disease appearing during the making of railway cuttings, canals, and other excavations in places where malaria had not previously been known; and there is sufficient evidence that malaria has appeared in the track of cultivation in the western States of America, and that it follows on the upturning of virgin soil, and even of soil that has been long fallow. Attempts have been made, without success, to separate a malarious poison from the gases generated by swamps, or from the air of malarious localities. Still more frequent and elaborate attempts have been made to discover the hypothetical poison among the numerous minute vegetable organisms that occur in the soil of

malarious (and non-malarious) places; and these also have hitherto yielded no solid result. Another hypothesis is that malaria is a "telluric intoxication" generated by the vegetative power of the soil when that power is not duly exhausted by plant growth. Lastly, there is an hypothesis that malarial fevers are caused by the excessive and sudden abstraction of heat from the body under the influence of cold and damp, and that the specific effects of the nocturnal chill, amounting to intermittent and remittent fever, are most usual and most marked in hot climates because of the antecedent exposure of the body to great solar heat.

Cinchona or Peruvian bark (with its alkaloid quinine) is a remedy universally applied with good effect in the treatment of malarial fevers. The treatment is usually commenced during the first intermission or remission. There is good evidence that the taking of quinine wards off the attack of malaria.

MALATIA, less correctly MALATÍYAH, the ancient Melitene of Cappadocia, a town of Kurdish Armenia in the vilayet of Diarbekir, about eight miles to the southwest of the Euphrates below the confluence of the Tokhma-su, and about half way between Baghdad and Constantinople, on a route which for ages has been one of the most important in that part of Asia. Asbuzi or Aspuzi, a place about five miles distant, which was formerly inhabited by the people of Malatia during the summer only, has become the permanent residence of a large part of the population (about 20,000, including both), but Malatia proper remains the administrative center of the sanjak. The remains of the ancient town are much dilapidated.

MALAY PENINSULA, MALACCA, or TÁNAH MALÁYU ("Malay Land"), the southernmost region in Asia, attached to Further India by the isthmus of Krá, whence it projects for about 600 miles, first south, then southeast parallel with Sumatra, to Cape Ramúnia (Romania), within 95 miles of the equator; it varies in width from 45 miles at the isthmus of Krá, and again at Talung, to 210 at Perak, and 150 at Selangor. The area is about 26,500 square miles, with a pop. (1901) of at least 676,138. The peninsula, which is washed on the west by the Bay of Bengal and Malacca Strait, on the east by the Gulf of Siam and China Sea, belongs geographically and ethnically rather to the eastern archipelago than to the Asiatic continent. Hence, whenever the proposed canalization of the isthmus of Krá is carried out, this region will fall into its natural position as one of the great islands of Malaysia. In a wider sense the peninsular formation begins properly at the head of the Gulf of Siam, about the parallel of Bangkok. But this northern section, being comprised within the limits of Siam proper and British Burmah, is not usually included in Malacca, whose political frontier toward the northwest is thus traced by the lower course of the river Pakshan, which there separates it from Tenasserim, the southernmost division of British Burmah. But east of that river there is no natural or political frontier toward Lower Siam, which embraces all the land as far south as the river Muda on the west coast, and on the east side as far as the state of Pahang. The seaboard, which is generally flat and overgrown with mangroves for five or six miles inland, is fringed with numerous islands and insular groups, of which the chief are Salanga (Junk Ceylon), Langkawi, and Pulo Penang on the west side; Singapore, Batang, and Bintang at the southern extremity; Tantara and Bardia on the east coast. All these islands, which may have a total area of some 5,000 square miles, seem to have originally formed part of the mainland, of which they may be regarded as scattered geological fragments.

Although known to Europeans since the beginning of

the sixteenth century, and nowhere more than 100 miles from the sea, the interior still remains one of the least known lands in Asia. D'Souza's large map, prepared in 1879 for the British Government, is still in many places almost a complete blank; the mountain ranges are traced only for short distances, chiefly on the west side below Kedah; the river courses and political boundaries are often merely conjectured, while the elevation of some of the highest peaks is absolutely unknown.

Excluding the Chinese, Klings, Bugis, and other more recent arrivals, the inhabitants of all these states belong to three distinct stocks—the Tai (Siamese), Malay, and Negrito. The Siamese of pure blood occupy the extreme north with scattered communities as far south as the town of Sengora. A mixed Malayo-Siamese people, commonly known as Samsams, form the bulk of the population in the lower parts of Ligor and Sengora, and in the north of Kedah. Although entirely assimilated to the Siamese in speech, customs, and religion, these Samsams appear to be allied physically much more to the Malay than to the Tai stock. Yet their national sympathies seem to be altogether with the dominant race, and the people, especially of Ligor, have during the present century zealously coöperated with the Siamese in their persistent efforts to subdue the Malays of the neighboring states.

All the rest of the peninsula, from about 7° N. to Cape Romania, may be regarded as essentially "Malay land," as it is in fact called by the people themselves.

The Malay and Negrito aborigines are collectively known to the civilized Malays as Semang and Sakei respectively, although much confusion seems to have arisen in the use of these terms, nor is this surprising, seeing that the two races themselves, who have been in contact for ages, have become largely intermingled and assimilated in customs, and even in speech.

MALAYS (Orang Maláyu, "Malay Men"), the dominant people in Malacca and the Eastern Archipelago (hence often called Malaysia), where they are diversely intermingled with other races, and where they have represented the local cultured element for over two thousand years. The Malays proper, that is, those who call themselves by this name, who speak the Malay language, and who possess a common sentiment of racial unity, are found in compact masses chiefly in the Malay peninsula as far north as 8° or 9° N. latitude, in the adjacent islands of Penang, Bintang, Lingén, etc., and in Sumatra, of which they occupy fully one-half, mainly in the south, along the east coast, and on parts of the west coast. In these lands alone they are really indigenous, and regard themselves as the aboriginal population. Elsewhere they are met in scattered communities chiefly round the coast of Borneo, in the Sulu Archipelago, in Tidor, Ternate, and some other members of the Molucca group, where they are held to be intruders or immigrants from Sumatra.

Long considered as an independent division of mankind, the Malays are now more generally affiliated to the Mongol stock, of which A. R. Wallace, De Quatrefages, and other eminent naturalists regard them as a simple variety more or less modified by mixture with other elements. The Malayan race, as a whole, undoubtedly very closely resembles the East-Asian populations from Siam to Manchuria. In fact, the typical Malay can scarcely be distinguished anthropologically from the typical Mongolian. He is described as of low stature, averaging little over five feet, of olive-yellow complexion inclining to light brown or cinnamon, brachycephalous, with somewhat flat features, high cheek bones, black and slightly oblique eyes, small but not flat nose, dilated nostrils, mouth wide but not projecting, hands and feet small and delicate, legs very thin and weak, coarse

black hair, always lank and round in section, scant or no beard.

During remote prehistoric times various sections of the Malay and Indonesian stocks were diffused westward to Madagascar, where the Hovas, of undoubted Malay descent, still hold the political supremacy, and eastward to the Philippine, Formosa, Micronesia, and Polynesia. This astonishing expansion of the Malaysian peoples throughout the Oceanic area is sufficiently attested by the diffusion of a common Malayo-Polynesian speech from Madagascar to Easter Island, and from Hawaii to New Zealand. (See POLYNESIA.)

MALCOLM, SIR JOHN, soldier, diplomatist, administrator, and author, was born at Burnfoot of Esk, near Langholm, Dumfriesshire, Scotland, on May 2, 1769. He died of paralysis on May 30, 1833.

MALDAH, a district in the lieutenant-governorship of Bengal, India, the Ganges river forming the continuous west and southwest boundary. The administrative headquarters are at English Bázár. The district, of which the area is 1,813 square miles, is divided into two almost equal parts by the Mahánandá river, flowing from north to south. The western tract between the Mahánandá and the main stream of the Ganges is a low-lying alluvial plain of sandy soil and great fertility. The eastern half is an elevated region broken by the deep valleys of the Tángan and Purnábhábá rivers and their small tributary streams.

MALDEN, a city of the United States, in Middlesex county, Mass., situated on the Malden river, five miles north of Boston. Malden was settled in 1634, being then known as the village of Mystic Side. It was incorporated as a town under the name of "Mauldon" in 1649, and became a city in 1882. It is a place of considerable industry, producing india-rubber boots and shoes, leather, lasts, sandpaper, etc. There are Turkey red dye-works; and the United States Government has a depot where large quantities of saltpeter are stored. Judson, the apostle of Burmah, was born in the town in 1788. The population has increased from 12,017 in 1880, to 33,664 in 1900.

MALDIVE ISLANDS, a remarkable archipelago in the Indian Ocean, the northern extremity of which is 7° west of Ceylon, and which extends in length from north to south to a space of 540 British miles.

The strange appearance which this group assumes in the old maps of the sixteenth and seventeenth centuries is entirely inaccurate in detail, but hardly so singular as the reality exhibited by modern surveys.

The archipelago is in some respects one of the most distinctly typical examples of a great aggregation of coral islands; indeed the technical name adopted by modern science for the annular coral formation which they exhibit (viz., *atoll*) has been taken from the language of these islands.

The Maldivé archipelago in plan may be compared to a chain suspended from a peg, each link of which chain is an irregularly elliptical chaplet of islets, the greater axes of these quasi-ellipses varying from about ninety miles downward. Taking separately any one of these chaplets (or *atolls*), we now know it to be the nearly level summit of a submarine table-mountain, rising abruptly from the unfathomable ocean, and approaching the surface within a distance which varies in different atolls from twenty to forty-five fathoms. The quasi-elliptical margin of the atoll is fringed, and the central expanse of its area is more or less sparsely studded, "with oval basins of coral rock just lipping the surface of the sea, and each containing a lake of clear water." These small oval basins, or ring-shaped reefs and islets, are in fact essentially miniatures of the atoll itself.

It is observed that in the double part of the chain of

atolls the openings are most numerous on those sides which are in juxtaposition.

All the islands of any extent are well clothed with wood, including many fine large trees and the ordinary shrubs of the Ceylon coast-jungle; where the jungle has been cleared, grass grows luxuriantly. But the cocoa-palm is the characteristic tree; and, low as the islands are, being covered with these trees, they can be seen from a masthead at fifteen miles. The appearance they present is that of a tuft or line of trees rising out of the water.

All the inhabited islands, and some besides, afford fresh water. But the quality of the water varies; and it is not uncommon to see two wells within a few feet of each other, one brackish and the other excellent. None of the wells are more than six feet deep.

The whole archipelago has from the earliest reports of it formed a little kingdom. Physically the number of atolls may be reckoned as nineteen, besides some solitary islands; but administratively these are grouped into thirteen and the term atoll has been transferred to this division.

The Maldives are inhabited by a people of old civilization, professing Islam, and ruled by a sultan of ancient lineage. What the number of islands may be we cannot say. They are popularly estimated at 12,000, as appears by the ancient style of the sultan as "king of 12,000 islands and thirteen atolls." Those marked with names in the British survey amount to 602, and the inhabited islands to 178. The men are of a darkish copper color, short stature (five feet two inches), and poor physique, but oval contour of face, pleasing expression, and large bright eyes, suggesting resemblance to both the Singhalese and Malabar people. The women are fairer than the men, with regular features, and clean, healthy aspect. A few of the people bear signs of African mixture, easily accounted for; and probably the blood of the smaller communities has been tinged by the occasional settlement of other foreigners. The people are decidedly unworlike; and there is hardly any crime of violence among them. They are said to be lax in morals and conversation; but otherwise their character and disposition have favorably impressed visitors. Though suspicious of strangers, they are hospitable; and among themselves they are kindly and affectionate to their kindred and in attendance on the sick. They are very cleanly in person and domestic habits. The population has been guessed in some books at 200,000; almost certainly one-tenth of that number would be an ample estimate.

The language is undoubtedly a dialect of Singhalese approaching the old *Elu*, but indicating a separation of ancient date, and it is more or less Mohammedanized.

Some of the oldest accounts of these islands represent them as always governed by a woman—a notion which probably arose among the Mohammedan visitors from finding that female heirs were not precluded from succession. Just the same notion was held about Achin in the seventeenth century, because there chanced to reign there several female sovereigns in succession. We do find females nominally reigning on the Maldives on two of the rare occasions when we have glimpses of their state, viz., in the time of Ibn Batuta, and again in the last century.

Islam is universally professed by the people, nor is there tradition of any other religion, though there are a variety of Pagan superstitions and some doubtful traces of Buddhism.

The sultan's residence and the capital of the kingdom is the island of Málé, which lies near the middle of the archipelago on the east side. It is about one mile long by three-quarters of a mile wide, and contains a population approaching 2,000.

The employments of the common people are fishing, gathering cocoa-nuts and cowries, weaving, and toddy-drawing. Women beat the cocoa-fiber, and twist it into yarn, make mats, prepare breadfruit by slicing and drying in the sun, spin and dye cotton thread, make sweetmeats of cocoa-nut and palm-sugar. Women are not secluded or veiled as in typical Moslem countries.

Rice, the staple of food, is imported. Other chief food is fish (chiefly dried bonito), breadfruit prepared in various ways, cocoa-nut, and a few fruits and vegetables. There are a few sheep and cattle on Mâlé island, which are occasionally slaughtered.

From the earliest notices the production of coir, the collection of cowries, and the weaving of excellent textures on these islands have been noted. This last, and that of fine mats, are the only manufactures in which skill is shown. The mats seem to be now produced only in Suadiva atoll; the cloth chiefly, but not solely, in Malosmadulu atoll.

The chief exports of the islands, besides coir and cowries (a decreasing trade), are cocoa-nuts, *copra* (i.e., cocoa-nut husk), tortoise-shell, and dried bonito-fish. An enormous amount of this last was formerly carried to Ceylon and Sumatra, the latter being supplied by traders who came from Chittagong.

Native vessels of 80 to 200 tons burthen make annual trips to Calcutta toward the end of the southwest monsoon, returning with the northeast monsoon in December. After leaving the Maldives they sight no land till Jagannâth. They carry thither the articles named above, and bring back rice, cotton stuffs, and sundries.

Animals are few. Those named are rats, numerous and destructive, which climb the cocoa-trees and devour the kernels; the large bat, called in India "flying-fox," also said to destroy many small cocoa-nuts; tortoises; a small snake said to be harmless, etc. Domestic animals are rare; a few goats and cattle are reared on Mâlé.

The climate is not oppressive or disagreeable, but is very unhealthy for strangers, whether Asiatic or European. Pop. about 30,000 (Mohammedans).

MALDON, a municipal and parliamentary borough and seaport town of Essex, England, is situated on an acclivity rising from the south side of the Blackwater, forty-four miles east-northeast of London and sixteen southwest from Colchester.

MALEBRANCHE, NICOLAS, a well-known disciple of Descartes, was the youngest child of Nicolas Malebranche, secretary to Louis XIII., and Catherine de Lauzon, sister of a viceroy of Canada, and was born at Paris on August 6, 1638. His death took place on October 13, 1715; according to Stock, the biographer of Berkeley, it was hastened by an excited metaphysical argument into which he had been drawn in the course of an interview sought by that philosopher.

MÂLER KOTLA, a native state in the Punjab, India, with an estimated area of 162 square miles, and an estimated population (1901) of about 80,000.

MALESHERBES, CHRÉTIEN GUILLAUME DE LA-MOIGNON DE, minister and afterward counsel for the defense of Louis XVI., came of a famous legal family, and was born at Paris on December 6, 1721. The young lawyer soon proved his intellectual capacity, when he was appointed president of the *cour des aides* in the parlement of Paris, in 1750, on the promotion of his father to be chancellor. In 1771 he was called upon to mix in politics; the parlements of France had been dissolved, and a new method of administering justice devised by Maupeou, which was in itself commendable as tending to the better and quicker administration of justice, but pernicious as exhibiting a tendency to over-centraliza-

tion, and as abolishing the hereditary "nobility of the robe," which, with all its faults, had from its nature preserved some independence, and been a check on the royal power. Malesherbes presented a strong remonstrance against the new system, and was at once banished to his country seat at St. Lucie, to be recalled, however, with the old parlement on the accession of Louis XVI., and to be made minister of the *maison du roi* in 1775. He only held office nine months, during which, however, he directed his attention to the police of the kingdom, which came under his department, and did much to check the odious practice of issuing *lettres de cachet*. On retiring from the ministry with Turgot in 1776, he betook himself entirely to a happy country and domestic life. He had always been an enthusiastic botanist; his avenue at St. Lucie was world famous; he had written against Buffon on behalf of the botanists whom Buffon had attacked, and had been elected a member of the Académie des Sciences as far back as 1750. He was now elected a member of the Académie Française, and everything seemed to promise a quiet and peaceful old age spent in the bosom of his family and occupied with scientific and literary pursuits, when the king in his difficulties wished for the support of his name, and summoned him back to the ministry in 1787. Again he held office but a short time, but returned to his country life this time with a feeling of insecurity and disquiet, and, as the troubles increased, retired to Switzerland. Nevertheless, in December, 1792, in spite of the fair excuse his old age and long retirement would have given him, he voluntarily left his asylum and undertook with Tronchet and Desèze the defense of the king before the convention, and it was a painful task to break the news of his condemnation to the king. After this effort he returned once more to the country, but in December, 1793, he was arrested with his daughter, his son-in-law M. de Rosambô, and his grandchildren, and on April 23, 1794, he was guillotined, after having seen all whom he loved in the world executed before his eyes for their relationship to him.

MALHERBE, FRANÇOIS DE, poet, critic, and translator, was born at Caen in 1555, and died in 1628.

MALINES. See MECHLIN.

MALLANWÂN, a town in Hardoi district, Oudh, India, situated on the Hardoi and Unas road, with a population of 11,670. Under native rule the town possessed considerable political importance, and upon the British annexation of Oudh it was selected as the civil headquarters of the district, but was abandoned in favor of Hardoi town on the reoccupation of the province after the mutiny.

MALLEMUCK, from the German rendering of the Dutch *Mallemugge* (which originally meant small flies or midges that madly whirled round a light), a name given by the early Dutch Arctic voyagers to the FULMAR, of which the English form is nowadays most commonly applied by sailors to the smaller Albatrosses, of about the size of a Goose, met with in the Southern Ocean—corrupted into "Molly Mawk," or otherwise modified.

MALLET, PAUL HENRI, author of several works about Danish history, was born in Geneva in 1730 and died in 1807.

MALLOV, botanically *Malva*, the typical genus of *Malvaceæ*, embracing about sixteen species of annual and perennial herbaceous plants, widely distributed throughout the northern hemisphere. The mallows possess the reniform one-celled anthers which distinguish the *Malvaceæ* from all other diadelphous exogens. The petals also are united by their base to the tube formed by the coalesced filaments of the stamens. The special characters which separate the genus *Malva* from others most nearly allied to it are the involucre,

consisting of a row of three separate bracts attached to the lower part of the true calyx, and the numerous single-seeded carpels disposed in a circle around a central axis, from which they become detached when ripe. The flowers are mostly white or pinkish, never yellow, the leaves radiate-veined, and more or less lobed or cut. The musk mallow (*Malva moschata*) is a perennial herb with five-partite, deeply cut leaves, and large rose-colored flowers clustered together at the ends of the branched stems, and is found growing along hedges and borders of fields, blossoming in July and August. It owes its name to a slight musky odor diffused by the plant in warm dry weather when it is kept in a confined situation.

MALLOW, a municipal parliamentary borough, market-town, and watering-place in the county of Cork, Ireland, is situated on the Blackwater, 150 miles southwest from Dublin, and twenty north from Cork.

MALMESBURY, a parliamentary borough and market-town of Wilts, England, is finely situated on an eminence almost surrounded by the lower Avon, and on a branch of the Great Western Railway, ninety-two miles west of London.

MALMESBURY, JAMES HARRIS, EARL OF, the best-known English diplomatist of the latter half of the eighteenth century, was born at Salisbury on April 21, 1746. Educated at Winchester, Oxford, and Leyden, the younger Harris was intended for diplomacy. In 1768 he became secretary to the British embassy at Madrid, and in 1770 he was left as *chargé d'affaires* at that court on the departure of Sir James Gray until the arrival of George Pitt, afterward Lord Rivers. He was appointed minister *ad interim* at Madrid, and in January, 1772, minister plenipotentiary to the court of Prussia. His success was marked, and in 1776 he was transferred to the court of Russia. In 1782 Sir James Harris (he was now a Knight of the Bath) returned home from ill-health, and was appointed by his friend Fox minister at the Hague. He was in recognition of his services created Lord Malmesbury of Malmesbury in the county of Wilts. In 1789 he returned to England, and took an anxious interest in politics, which ended in his seceding from the Whig party with the duke of Portland in 1793, in which year he was sent, but in vain, to try to keep Prussia true to the first coalition against France. In 1794 he was sent to Brunswick to solicit the hand of the unfortunate Princess Caroline for the prince of Wales, to marry her as proxy, and conduct her to her husband in England. In 1796 and 1797 he was at Paris and Lille vainly negotiating with the French Directory. After 1797 he became partially deaf, and quitted diplomacy altogether; but for his long and eminent services he was in 1800 created earl of Malmesbury, and Viscount Fitzharris, of Heron Court, in the county of Hants. His later years were free from politics, and till his death in 1820 he lived very quietly and almost forgotten.

MALMESBURY, WILLIAM OF, an historical writer of the twelfth century, the date of whose birth is usually assigned to the year 1095, but may with more probability be placed twenty years earlier. Died about 1142.

MALMÖ, a seaport town of Sweden, inferior only to Stockholm and Gothenburg in importance, is the capital of the län or province of Malmöhus, and stands on the eastern shore of the Sound, opposite Copenhagen, from which it is sixteen miles distant. The town, which is built on a level plain, formerly had strong fortifications, of which all that now remains is the citadel, where the earl of Bothwell was imprisoned for some time after 1573; it is at present used as a house of correction.

MALONEY, a town of New York, in Franklin county, of which it is the capital. There is extensive water-power

here, which is utilized in various manufactures. Near the town are quarries of Potsdam sandstone. The church and educational facilities of the town are good, and it has railroad and telegraph connections. The banking facilities are ample. There has been a steady growth of the town in late years. Population (1906), 5,935.

MALORY, SIR THOMAS, the author or compiler of the *Morte Darthur*, was born most probably about the year 1430. Malory himself tells us that he finished the book in the ninth year of Edward IV. For the place of the *Morte Darthur* in the literary history of the Arthurian legend, see ARTHUR, GEOFFREY OF MONMOUTH, GRAIL (HOLY), etc.

MALPIGHI, MARCELLO, of Bologna, born in 1628, was one of the first to apply the microscope to the study of animal and vegetable structure; his discoveries are so numerous and important that he may be considered to be the founder of microscopic anatomy. Shortly before his death, he drew up a long account of his academical and scientific labors, correspondence, and controversies, and committed it to the charge of the Royal Society of London, a body with which he had been in intimate relations for more than twenty years. He died in 1694.

The compound microscope (invented in the Netherlands) had been used in Italy (Rome) to study the parts and organs of the bee as early as 1625, and it was employed by Malpighi and by his contemporaries Hooke (botanist) and Leeuwenhoek; the illumination of the objects was always direct, the mirror being a much later addition, and the tube was of unwieldy length. Owing to the inability to overcome spherical and chromatic aberration in compound lenses, the simple microscope came again into common use, and continued to be the chief instrument in the study of minute anatomy until the introduction of flint-and-crown glass lenses by English opticians about a century later. It was Malpighi's practice to open animals alive, and some of his most striking discoveries were made under those circumstances. Although Harvey had correctly inferred the existence of the capillary circulation, he had never seen it; it was reserved for Malpighi in 1661 (four years after Harvey's death) to see for the first time the marvelous spectacle of the blood coursing through a net-work of small tubes on the surface of the lung and of the distended urinary bladder of the frog. We are enabled to measure the difficulties of microscopic observation at the time by the fact that it took Malpighi four years longer to reach a clear understanding of the corpuscles in the frog's blood, although they are the parts of the blood by which its movement in the capillaries is made visible. His discovery of the capillary circulation was given to the world in the form of two letters *De Pulmonibus*, addressed to Borelli, published at Bologna in 1661 and reprinted at Leyden and other places in the years following; the letters to Borelli contained also the first account of the vesicular structure of the human lung, and they made a theory of respiration for the first time possible. The achievement that comes next both in importance and in order of time was a demonstration of the plan of structure of secreting glands; against the current opinion (revived by Ruysch forty years later) that the glandular structure was essentially that of a closed vascular coil from which the secretion exuded, he maintained that the secretion was formed in terminal acini standing in open communication with the ducts. The name of Malpighi is still associated with his discovery of the soft or mucous character of the lower stratum of the epidermis, of the vascular coils in the cortex of the kidney, and of the follicular bodies in the spleen. He was the first to attempt the finer anatomy

of the brain, and his descriptions of the distribution of gray matter and of the fiber-tracts in the cord, with their extensions to the cerebrum and cerebellum, are distinguished by accuracy; but his microscopic study of the gray matter conducted him to the opinion that it was of glandular structure and that it secreted the "vital spirits." At an early period he applied himself to vegetable histology as an introduction to the more difficult study of the animal tissues, and he was acquainted with the spiral vessels of plants in 1662.

MALSTATT-BURBACH, a town in the district of Treves, Prussia, is situated on the right bank of the Saar (Sarre), almost contiguous with the town of St. Johann, and separated from Saarbrücken by the river. It lies in the midst of an important coal-mining and industrial district, and is itself little more than a long and narrow row of manufactories and workmen's houses.

MALT is the grain of any cereal artificially germinated so as to induce certain changes in the constitution of the seed, specially a conversion of a portion of the starch into sugar. The varieties of grain usually employed for malting are barley and bere or bigg, and the processes of preparing the substance are explained under BREWING.

The specific effect of the malting of grain is to transform by the process of germination a proportion of the starch into soluble sugar and dextrin. These changes are effected by the agency of a peculiar nitrogenous ferment, diastase, which exists in the grain, but which is increased in amount during the germination. The precise sequence of changes, and the exact nature of the new chemical compounds evolved, are still matters of some doubt. It is clearly established that the ferment of barley is incapable of transforming the starch on which it operates entirely into sugar, the ultimate products of the action being partly dextrin and partly sugar. The relative proportions of these bodies evolved by fermentation from starch have been matter of dispute, some holding that from three molecules of starch there are evolved two molecules of dextrin and one of sugar, while others affirm that the yield is two of sugar and one of dextrin, and a third party hold that for each molecule of sugar there is one of dextrin produced.

By the processes of malting 100 parts by weight of barley yield about eighty of kiln-dried malt and two to three of dried radicle and plumule called "malt dust."

MALTA is the chief island of the Maltese group, consisting of Malta, Gozo, which lies between them, and the two islets Cominotto and Filfla, a crown colony, and one of the Mediterranean possessions of Great Britain. Malta is seventeen and one-quarter miles long by nine and one-quarter broad, containing an area of about ninety-five square miles (about two-thirds the size of the Isle of Wight), and Gozo is nine miles long by five wide, with an area of twenty square miles. The islands lie directly south of Sicily, distant from fifty-five to sixty miles, near the center of the Mediterranean basin, where they appear as the remains of an ancient chain of islands, much worn and still wearing away by the sea. Gozo, which has the same general character as Malta, possesses more moisture and richer soil, and therefore more verdure. A cluster of single hills, remarkable for their steeply conical shape, on one of which stands Rabato, the principal village, is near the middle of the island. Along the northern and eastern shores of Malta the coast-line is frequently broken by deep indentations and bays (St. Paul's, St. George's, and St. Julian's Bays); on the peninsulas in and round the most remarkable of these Valetta and its fortifications are built. The surface of the country is diversified by valleys and steep hills; there is little water, and no river, brook, or lake exists on any of the islands. The high-

est point of Malta is near Casal Dingli, about 750 feet above the sea to the south; a little farther north lies the ancient capital, Citta Vecchia, upon another steep height; west of these lies the range of Bingemma Hills running northeast to southwest; from this higher ground the island slopes somewhat toward the northwest.

The general appearance of the land is bare, owing to the want of woodland, and also to the use of stone walls as inclosures for the fields, which in the east of the island are smaller than in the west. The dark foliage of the carob and the singular masses of the prickly pear are, however, very marked in the landscape, which, with its contrasts of blue sea running into the brown and yellow land, heightened by whatever of green may be, is of fascinating beauty under the effects of morning light and setting sun. The land is closely cultivated; often the soil is terraced on the sides of the hills as a safeguard against the winter rains. The soil is in many places extremely thin; it is, however, so fertile that it produces two and sometimes three crops in a year. Large quantities of early potatoes, grown for the English market, corn sufficient to supply the island for four months of the year, cotton, principally for home use, and a fine red-flowering clover, called *sulla*, are the chief crops; excellent honey is obtained from Gozo; oranges and figs come to great perfection. Goats abound, but few cows are kept; the mules and asses are fine; cattle and sheep for butcher meat are imported from Barbary. Fish is good and abundant. The flowers of Malta are famous; Cicero mentions the cushions stuffed with roses used by Verres, and many a lovely garden is hidden behind the high stone walls. The interesting flora of the islands approaches that of Africa (to which continent the old geographers considered them to belong, as the French do still), including the palm, cactus, and other subtropical plants. The scanty fauna is, for the most part, European; the Maltese dog is mentioned by Strabo and other old writers; a few still remain, though not wild. Of birds there are about ten or twelve indigenous species, but a large number of migratory birds pass or rest here. The marine plants and animals also offer a rich fund of material to the student.

The Maltese are a strong well-formed race, the men dark, handsome, and lithe, the women with black eyes and fine hair and an easy carriage; as in other Eastern nations, the working classes grow old at a comparatively early age. They are a cheerful, good-humored, and industrious people, sober and abstemious, though quick-tempered and addicted to the use of the knife. Bread or pasta, with a few olives, a little oil, or milk cheese, forms the chief support of the poor, who seldom or never eat meat, and drink but little of the light wine of the country. The gentry have a large admixture of Spanish, Italian, and French, but among the people in general the Arab race and character predominate, influenced by contact with Sicily. Of the native language 70 per cent. consists of Arabic words, the rest being chiefly a corrupt Italian; that spoken in Gozo is the purest Maltese. The festivals and ceremonials of the Roman Church are kept up to an extraordinary degree, together with a few that seem to be derived from the Greek Church. The perpetual ringing of monotonous church bells, and the peculiar method of striking time, are peculiar relics of South Italian customs.

The population, which in 1837 was 115,570, was 183,679 in 1900, exclusive of British troops and their families, about 24,000 being English and foreigners; it is rapidly increasing, and is unequally distributed, the greater part being settled in the large casals or villages on the eastern half of Malta, including the densely

populated Valetta; large tracts to the west are bare and but sparsely inhabited; about one-third of the island is rocky and uncultivated.

MALTE-BRUN, CONRAD, a distinguished geographer, was born August 12, 1755, at Thysted in Denmark, and died at Paris, December 14, 1826.

MALTHUS, THOMAS ROBERT, the scientific expounder of the principle of population, was born in 1766 at the Rookery, a small estate owned by his father in the county of Surrey, England. In 1784 he was sent to Cambridge, where he was ninth wrangler, and became fellow of his own college (Jesus) in 1797. The same year he received orders, and undertook the charge of a small parish in Surrey, still, however, retaining his fellowship. In the following year he published the first edition of his great work, *An Essay on the Principle of Population as it Affects the Future Improvement of Society, with Remarks on the Speculation of Mr. Godwin, M. Condorcet, and other writers*. The work excited a good deal of surprise as well as attention; and with characteristic thoroughness and love of truth the author went abroad to collect materials for the verification and more exhaustive treatment of his views. As Britain was then at war with France, only the northern countries of Europe were quite open to his research at that time; but during the brief peace of Amiens Malthus continued his investigations in France and Switzerland. The result of these praiseworthy labors appeared in the greatly enlarged and more mature edition of his work, which was published in 1803. In 1805 Malthus married happily, and not long after was appointed professor of modern history and political economy in the East India Company's College at Haileybury. This situation he retained till his death in 1834. Malthus was one of the most amiable, candid, and cultured of men. In all his private relations he was not only without reproach, but distinguished for the beauty of his character. He bore the popular abuse and misrepresentation without the slightest murmur or sourness of temper. The aim of his inquiries was to promote the happiness of mankind, which could be better accomplished by pointing out the real possibilities of progress than by indulging in vague dreams of perfectibility apart from the actual facts which condition human life.

Malthus' *Essay on Population* grew out of some discussions which he had with his father respecting the perfectibility of society. His father shared the theories on that subject of Condorcet and Godwin; and his son combated them on the ground that the realization of a happy society will always be hindered by the miseries consequent on the tendency of population to increase faster than the means of subsistence. His father was struck by the weight and originality of his views, asked him to put them in writing, and then recommended the publication of the manuscript. It was in this way the *Essay* saw the light. Thus it will be seen that both historically and philosophically the doctrine of Malthus was a corrective reaction against the superficial optimism diffused by the school of Rousseau. It was the same optimism, with its easy methods of regenerating society and its fatal blindness to the real conditions that circumscribe human life, that was responsible for the wild theories of the French Revolution and many of its consequent excesses.

MALTON, a parliamentary borough of Yorkshire, England, which includes Old Malton and New Malton in the North Riding, and the parish of Norton in the East Riding. New Malton is situated on an eminence on the right bank of the Derwent, twenty-two miles northeast of York and 213 north of London. Old Malton lies about a mile to the northeast, and a bridge across the river connects New Malton with Norton.

MALTZAN, HEINRICH K. E. H. FREIHERR (BARON) VON, African and Oriental traveler, was born in the vicinity of Dresden, and studied law at Jena, but on account of ill-health spent much of his time from 1850 in travel. His first book of travel, *Three Years in the Northwest of Africa*, appeared in 1863, and was followed by a variety of works and essays, popular and scientific, till a little before his death at Pisa in 1874, when he put an end with his own hand to neuralgic pains which had tortured him for years.

MALUS, ÉTIENNE LOUIS, the discoverer of the laws of the polarization of light by reflection, born at Paris June 23, 1775, was the son of Anne Louis Malus du Mitry, and of Louisa Charlotte Desboves, his wife. Malus died February 24, 1812, universally regretted by the lovers of science in all countries, and deeply lamented by his colleagues, who said of him, as Newton did of Cotes, that if his life had been prolonged we should at last "have known something" of the laws of nature.

MALVASIA (from the Greek *Monembasia*, i.e., the city of the single approach or entrance; the Italian *Napoli di Malvasia*, the Turkish *Mengeshe* or *Beneshe*), one of the principal fortresses and commercial centers of the Levant during the Middle Ages, still represented by a considerable mass of ruins and a town of about 1,000 inhabitants, stood on the east coast of the Morea, contiguous to the site of the ancient Epidaurus Limer, of which it took the place. So extensive was its trade in wine that the name of the place became familiar throughout Europe as the distinctive appellation of a special kind—the Italian, *Malvasia*, Spanish, *Malvagia*, French *Malvoisie*, English *Malvesie* or *Malmsea*. The wine was not of local growth, but came for the most part from Tenos and others of the Cyclades.

MALVERN, GREAT, a watering-place of Worcestershire, England, beautifully situated on the eastern slope of the Malvern Hills, eight miles southwest-by-south of Worcester, and 120 northwest-by-west of London. The town is irregularly built, but there are many villas, and on account of its fine situation in the center of the Chase of Malvern, its pure air, and its chalybeate and bituminous springs, it is much frequented by summer visitors. At Malvern Wells, two miles south of Malvern, is the celebrated "Holy Well," the water of which is of perfect purity.

MÁLWA, an historical province of Central India, roughly coextensive with the western portion of the Central India agency, is bounded on the north by Hindustan Proper, on the east by Bundelkhand, on the south by the Deccan, and on the west by Rájputána. It consists of an upland region, with many fertile valleys, included within the main rivers of the Ganges, the Són, the Chambal, and the Nerbudda.

MAMELUKE, a corruption of the Arabic *Mamlúk* (*Memlook*), a slave. The name of Mamelukes has passed into history from the bodyguard of Turkish slaves first formed in Egypt under the successors of Saladin, who ultimately usurped the supreme power.

MAMMALIA is the name invented by Linnæus (from the Latin, *mamma*), and now commonly used by zoölogists for one of the classes of vertebrated animals which, though the best known and undoubtedly the most important group of the animal kingdom, has never received any generally accepted vernacular designation in our language. The unity of structure of the animals composing this class, and their definite demarkation from other vertebrates, were not recognized until comparatively modern times, and hence no word was thought of to designate what zoölogists now term a mammal. The nearest equivalents in common use are "beast" and "quadruped," both of which, however,

cover a different ground, as they are often used to include the larger four-footed reptiles, and to exclude certain undoubted mammals, as man, bats, and whales.

The limits of the class, as now understood by zoologists, are perfectly well defined, and, although certain forms still existing on the earth (though not those mentioned above as excluded by the popular idea) are of exceedingly aberrant structure, exhibiting several well-marked characters which connect them with the lower vertebrated groups, common consent retains them in the class with which the great proportion of their characters ally them, and hitherto no traces of any species showing still more divergent or transitional characters have been discovered. There is thus a great interval not bridged over by any known forms, recent or extinct, between mammals and other vertebrates.

In the gradual order of evolution of living beings, mammals taken altogether are certainly the highest in organization, as they were probably the last to appear on the earth's surface, though this must be said with some reservation, pending further knowledge of the early history of the class of birds. But, as in speaking of all other large and greatly differentiated groups, this expression must not be understood in too limited a sense. The tendency to gradual perfection for their particular station in life, which all groups manifest, leads to various lines of specialization, or divergence from the common or general type, which may or may not take the direction of elevation. A too complex and sensitive condition of organization may in some circumstances of life be disadvantageous, and modification may then take place in a retrograde direction. In mammals, as in other classes, there are low forms as well as high forms, but by any tests that can be applied, especially those based on the state of development of the central nervous system, it will be seen that the average exceeds the average of any other class; that many species of this class far excel those of any other in perfection of structure, and that it contains one form which is unquestionably the culminating point yet arrived at among organized beings.

With regard to the time of the first appearance of mammals upon the earth, the geological record is provokingly imperfect. At the commencement of the Tertiary period they were abundant, and already modified into most of the leading types at present existing. It was at one time thought that they first came into being at this date, but the discovery of fragments of numerous small species has revealed the existence of some forms of the class at various periods throughout almost the whole of the age of the deposition of the Secondary rocks.

It hardly need be said that mammals are vertebrated animals, and possess all the characteristics common to the members of that division of the animal kingdom. They are separated from the *Ichthyopsida* (fishes and amphibia) and agree with the *Sauropsida* (reptiles and birds) in the possession during their development of an amnion and allantois, and in never having external branchiæ or gills. They differ from reptiles and resemble birds in being warm-blooded, and having a heart with four cavities and a complete double circulation. They differ from both birds and reptiles in the red corpuscles of the blood being nucleated and, with very few exceptions, circular in outline; in the lungs being freely suspended in a thoracic cavity, separated from the abdomen by a complete muscular partition, the diaphragm, which is the principal agent in inflating the lungs in respiration; in having but one aortic arch, which curves over the left bronchus; in the skin being more or less clothed with hair, and never with feathers; in the greater perfection of the commissural system of the cerebral

hemispheres, which has either a complete corpus callosum, or an incomplete one associated with a very large anterior commissure; in having no syrinx or inferior vocal organ, but a complete larynx at the upper end of the trachea; in having a mandible of which each ramus (except in very early developmental conditions) consists of a single bone on each side, articulating to the squamosal, without the intervention of a quadrate bone; in having a pair of laterally placed occipital condyles instead of one median one; and in the very obvious character of the female being provided with mammary glands, by the secretion of which the young (produced alive and not by means of externally hatched eggs) are nourished for some time after birth.

In common with all vertebrated animals, mammals have never more than two pairs of limbs. In the great majority of the class both are well-developed and functional, and adapted for terrestrial progression, as the larger number of mammals live ordinarily on the surface of the earth. They are, however, by no means limited to this situation. Some species spend the greater part of their lives beneath the surface, their fore limbs being specially modified for burrowing; others are habitually arboreal, their limbs being fitted for climbing or hanging to boughs of trees; some are as aerial as birds, the fore limbs being developed into wings of a special character; others are as aquatic as fishes, the limbs assuming the form of fins or paddles. In many of the latter the hinder extremities are either completely suppressed, or present only in a rudimentary state. In no known mammal are the fore limbs absent.

The hinder extremity of the axis of the body is usually prolonged into a tail, which may be a mere pendent appendage, or modified to perform various functions, as grasping boughs in climbing, or even gathering food, in the case of the prehensile-tailed monkeys and opossums, swimming in the *Cetacea*, and acting as a flap to drive away troublesome insects from the skin in the *Ungulata*.

GENERAL ANATOMICAL CHARACTERS OF THE MAMMALIA.

Tegumentary Structures.—The external surface of the greater number of members of the class is thickly clothed with a peculiarly modified form of epidermis, commonly called hair. This consists of hard, elongated, slender, cylindrical or tapering, filiform, unbranched masses of epidermic material, growing from a short papilla sunk at the bottom of a follicle in the derm or true skin. Such hairs upon different parts of the same animal, or upon different animals, assume various forms, and are of various sizes and degrees of rigidity—as seen in the delicate, soft, velvety fur of the mole, the stiff bristles of the pig, and the spines of the hedgehog and porcupine, all modifications of the same structures. Hair having a property of mutual cohesion or “felting,” which depends upon a roughened scaly surface and a tendency to curl, as in domestic sheep (in which animals this property has been especially cultivated by selective breeding), is called “wool.”

In a large number of mammals hairs of one kind only are scattered pretty evenly over the surface, but in many there are two kinds, one longer, stiffer, and alone appearing on the surface, and the other shorter, finer, and softer, constituting the under fur, analogous to the down of birds. In most cases hairs of a different character from those of the general surface grow in special regions, forming ridges or tufts on the median dorsal or ventral surface or elsewhere. The tail is very often completed in this way by variously disposed elongated hairs. The margins of the eyelids are almost always furnished with a special row of stiffish hairs, called *cilia* or eyelashes, and in most

mammals specially modified hairs, constituting the *vibrissæ* or whiskers, endowed, through the abundant nerve supply of their basal papillæ, with special tactile powers, grow from the lips and cheeks. In some mammals the hairy covering is partial and limited to particular regions; in others, as the hippopotamus and the *Sirenia*, though scattered over the whole surface, it is extremely short and scanty; but in none is it reduced to so great an extent as in the *Cetacea*, in which it is limited to a few small bristles confined to the neighborhood of the lips and nostrils, and often only present in the young or even foetal condition.

Some kinds of hairs, as those of the mane and tail of the horse, appear to persist throughout the life-time of the animal; but more generally, as in the case of the body hair of the same animal, they are shed and renewed periodically, generally annually. Many mammals have a longer hairy coat in winter, which is shed as summer comes on; and some few, which inhabit countries covered in winter with snow, as the arctic fox, variable hare, and ermine, undergo a complete change of color in the two seasons, being white in winter, and gray or brown in summer.

True scales, or flat imbricated plates of horny material, covering the greater part of the body, so frequently occurring in reptiles, are found in one family only of mammals, the *Manidae* or pangolins; but these are also associated with hairs growing from the intervals between the scales or on the parts of the skin not covered by them. Similarly imbricated epidermic productions from the covering of the under surface of the tail of the flying rodents of the genus *Anomalurus*; and flat scutes, with the edges in apposition, and not overlaid, clothe both surfaces of the tail of the beaver, rats, and others of the same order, and also of some insectivores and marsupials. The armadillos alone have an ossified exoskeleton, composed of plates of true bony tissue, developed in the derm or corium, and covered with scutes of horny epidermis. Other epidermic appendages are the horns of ruminants and rhinoceroses—the former being elongated, tapering, hollow caps of hardened epidermis of fibrillated structure, fitting on and growing from conical projections of the frontal bone, and always arranged in pairs, while the latter are of similar structure, but without any internal bony support, and situated in the median line. Callosities, or bare patches covered with hardened and thickened epidermis, are found over the ischial tuberosities of many apes, the sternum of camels, on the inner side of the limbs of the *Equida*, the grasping under surface of the tail of prehensile-tailed monkeys, etc. The greater part of the skin of both species of one-horned Asiatic rhinoceros is immensely thickened and stiffened by increase of the tissue of both the derm and the epiderm, constituting the well known jointed "armor-plated" hide of those animals.

With very few exceptions, the terminal extremities of the digits of both limbs are more or less protected or armed by epidermic plates or sheaths, constituting the various forms of nails, claws, or hoofs. These are wanting in the *Cetacea* alone.

Besides the universally distributed sebaceous glands connected with the pilose system, most mammals have special glands situated in modified portions of the integument, often involutioned to form a shallow recess or a deep sac with a narrow opening, situated in various parts of the surface of the body, and which secrete odorous substances, by the aid of which individuals appear to recognize one another, and which probably afford the principal means by which wild animals are able to become aware of the presence of other members of the species, even at great distances. Although the commencement of the modifications of portions of the ex-

ternal covering for the formation of special secretions may be at present difficult to understand, the principle of natural selection will readily explain how such organs can become fixed and gradually increase in development in any species, especially as there would probably be a corresponding modification and increased sensibility of the olfactory organs. Such individuals as by the intensity and peculiarity of their scent had greater power of attracting the opposite sex would certainly be those most likely to leave descendants to inherit and in their turn propagate the modification.

Teeth are present in nearly all mammals, and are applied to various purposes. They are, however, mainly subservient to the function of alimentation, being used either in procuring food by seizing and killing living prey or in gathering and biting off portions of vegetable material, and more indirectly in tearing or cutting through the hard protective coverings of food substances, as the husks and shells of nuts, or in pounding, crushing, or otherwise mechanically dividing the solid materials before swallowing, so as to prepare them for digestion in the stomach. Certain teeth are also in many animals most efficient weapons of offense and defense, and for this purpose alone, quite irrespective of subservency to the digestive process, are they developed in the male sex of many herbivorous animals, in the females of which they are absent or rudimentary.

Teeth belong essentially to the tegumentary or dermal system of organs, and, as is well seen in the lowest vertebrates, pass by almost insensible gradations into the hardening spines and scutes formed upon the integument covering the outer surface of the body, but in mammals they are more specialized in structure and limited in locality. In this class they are developed only in the gums or fibro-mucous membrane covering the alveolar borders of the upper and lower jaw or the premaxillary and maxillary bones and the mandible. In the process of development, for the purpose of giving them that support which is needful for the performance of their functions, they almost always become implanted in the bone—the osseous tissue growing up and molding itself around the lengthening root of the tooth, so that ultimately they become apparently parts of the skeleton. In no mammal, however, does ankylosis or bony union between the tooth and jaw normally take place, as in many fishes and reptiles—a vascular layer of connective tissue, the alveolo-dental membrane, always intervening. The presence of two or more roots, frequently met with in mammals, implanted into corresponding distinct sockets of the jaw, is peculiar to animals of this class.

The greater number of mammalian teeth when fully formed are not simple and homogeneous in structure, but are composed of several distinct tissues.

Succession of Teeth.—The dentition of all mammals consists of a definite set of teeth almost always of constant and determinate number, form, and situation, and, with few exceptions, persisting in a functional condition throughout the natural term of the animal's life. In many species these are the only teeth which the animal ever possesses—the set which is first formed being permanent, or, if accidentally lost, or decaying in extreme old age, not being replaced by others. These animals are called Monophyodont. But, in the larger number of mammals, certain of the teeth are preceded by others, which may be only of a very transient, rudimentary, and functionless character (being in the seals, for example, shed either before or within a few days after birth), or may be considerably developed, and functionally occupy the place of the permanent teeth for a somewhat lengthened period, during the growth and development of the latter and of the jaws. In all cases these

teeth disappear (by the absorption of their roots and shedding of the crowns) before the frame of the animal has acquired complete maturity, as evidenced by the coalescence of the epiphyses of the osseous system. As these teeth are, as a general rule, present during the period in which the animal is nourished by the milk of the mother, the name of "milk teeth" has been commonly accorded to them, although it must be understood that the epoch of their presence is by no means necessarily synchronous with that of lactation. Animals which possess such teeth are called *Diphyodont*. No mammal is known to have more than two sets of teeth; and the definite and orderly replacement of certain members of the series is a process of quite a different nature from the indefinite succession which takes place in all the teeth continuously throughout the lifetime of the lower vertebrates.

In animals which have two sets of teeth the number of the teeth of the permanent series which are preceded by milk teeth varies greatly, being sometimes, as in marsupials and some rodents, as few as one on each side of each jaw, and sometimes including the larger portion of the series.

General Arrangement, Homologies, and Notation of Teeth of Mammals.—The teeth of the two sides of the jaws are always alike in number and character, except in cases of accidental or abnormal variation, and in the one remarkable instance of constant deviation from bilateral symmetry among mammals, the tusks of the narwhal, in which the left is of immense size, and the right rudimentary. In those animals also, as the dolphins and some armadillos, which have a very large series of similar teeth, not always constant in number in different individuals, there may be differences in the two sides; but, apart from these, in describing the dentition of any mammal, it is quite sufficient to give the number and characters of the teeth of one side only. As the teeth of the upper and the lower jaws work against each other in masticating, there is a general correspondence or harmony between them, the projections of one series, when the mouth is closed, fitting into corresponding depressions of the others. There is also a general resemblance in the number, characters, and mode of succession of both series, so that, although individual teeth of the upper and lower jaws may not be in any strict sense of the term homologous parts, there is a great convenience in applying the same descriptive terms to the one which are used for the other.

Modifications of the Teeth in Relation to their Functions.—The principal functional modifications noticed in the dentition of *Mammalia* may be roughly grouped as (1) piscivorous, (2) carnivorous, (3) insectivorous, (4) omnivorous, and (5) herbivorous, each having, of course, numerous variations and transitional conditions.

1. The essential characters of a piscivorous dentition are best exemplified in the dolphins, and also (as modifications of the carnivorous type) in the seals. It consists of an elongated, rather narrow mouth, wide gape, with numerous subequal, conical, sharp-pointed, recurved teeth adapted simply to rapidly seize, but not to divide or masticate, active, slippery, but not powerful prey. All animals which feed on fish as a rule swallow and digest them entire, a process which the structure of prey of this nature, especially the intimate interblending of delicate, sharp-pointed bones with the muscles, renders very advantageous, and for which the above-described type of dentition is best adapted.

2. The carnivorous type of dentition is shown in its most perfect development among existing mammals in the *Felidae*. The function being here to seize and kill struggling animals, often of large size and great muscular power, the canines are immensely developed, trenchant,

and piercing, and are situated wide apart so as to give the firmest hold when fixed in the victim's body. The jaws are as short as is consistent with the free action of the canines, so that no power may be lost. The incisors are very small, so as not to interfere with the penetrating action of the canines, and the crowns of the molar series are reduced to scissor-like blades, with which to pare off the soft tissues from the large bones, or to divide into small pieces the less dense portions of the bone for the sake of nutriment afforded by the blood and marrow it contains. The gradual modification between this and the two following types will be noticed in their appropriate places.

3. In the most typical insectivorous animals, as the hedgehogs and shrews, the central incisors are elongated, pointed, and project forward, those of the upper and lower jaw meeting like the blades of a pair of forceps, so as readily to secure small, active prey, quick to elude capture, but powerless to resist when once seized. The crowns of the molars are covered with numerous sharp edges and points, which, working against each other, rapidly cut up the hard-cased insects into little pieces, fit for swallowing and digestion.

4. The omnivorous type, especially that adapted for the consumption of soft vegetable substances, such as fruits of various kinds, may be exemplified in the dentition of man, of most monkeys, and of the less modified pigs. The incisors are moderate, subequal, and cutting. If the canines are enlarged, it is usually for other purposes than those connected with food, and only in the male sex. The molars have their crowns broad, flattened, and elevated into rounded tubercles.

5. In the most typically herbivorous forms of dentition, as seen in the horse and kangaroo, the incisors are well developed and trenchant, adapted for cutting off the herbage on which the animals feed; the canines are rudimentary or suppressed; the molars are large, with broad crowns, which in the simplest forms have strong transverse ridges, but may become variously complicated in the higher degrees of modification which this type of tooth assumes.

The natural groups of mammals, or those which in our present state of knowledge we have reason to believe are truly related to each other, may each contain examples of more than one of these modifications.

The Skeleton.—The skeleton is a system of hard parts, forming a framework which supports and protects the softer organs and tissues of the body. It consists of dense fibrous and cartilaginous tissues, of which portions remain through life in this state, but the greater part is transformed during the growth of the animal into bone or osseous tissue. This is characterized by a peculiar histological structure and chemical composition, being formed mainly of a gelatinous basis, strongly impregnated with salts of lime, chiefly phosphate, and disposed in a definite manner, containing numerous minute nucleated spaces or cavities called *lacunae*, connected together by delicate channels or *canaliculi*, which radiate in all directions from the sides of the *lacunae*. Parts composed of bone are, next to the teeth, the most imperishable of all the organs of the body, often retaining their exact form and internal structure for ages after every trace of all other portions of the organization has completely disappeared, and thus, in the case of extinct animals, affording the only means of attaining a knowledge of their characters and affinities.

In the armadillos and their extinct allies alone is an ossified exoskeleton, or bony covering developed in the skin, present. In all other mammals the skeleton is completely internal. It may be described as consisting of an axial portion belonging to the head and trunk, and an appendicular portion belonging to the limbs. There

are also certain bones called splanchnic, being developed within the substance of some of the viscera. Such are the *os cordis* and *os penis* found in some mammals.

It is characteristic of all the larger bones of the *Mammalia* that their ossification takes its origin from several distinct centers. One near the middle of the bone, and spreading throughout its greater portion, constitutes the *diaphysis*, or "shaft," in the case of the long bones. Others near the extremities, or in projecting parts, form the *epiphyses*, which remain distinct during growth, but ultimately coalesce with the rest of the bone.

The axial skeleton consists of the skull, the vertebral column (prolonged at the posterior extremity into the tail), the sternum, and the ribs.

The appendicular portion of the framework consists, when completely developed, of two pairs of limbs, anterior and posterior.

The anterior limb is present and fully developed in all mammals, being composed of a shoulder girdle and three segments belonging to the limb proper, viz., the upper arm or brachium, the fore-arm or antibrachium, and the hand or manus.

The posterior limb is constructed upon a plan very similar to that of the anterior extremity. It consists of a pelvic girdle and three segments belonging to the limb proper, viz., the thigh, the leg, and the foot or pes.

Digestive System.—The search after the purpose which every modification of structure subserves in the economy is always full of interest, and, if conducted with due caution and sufficient knowledge of all the attendant circumstances, may lead to important generalizations. It must always be borne in mind, however, that adaptation to its special function is not the only cause of the particular form or structure of an organ, but that this form, having in all probability been arrived at by the successive and gradual modification of some other different form from which it is now to a greater or less degree removed, has other factors besides use to be taken into account. In no case is this principle so well seen as in that of the organs of digestion. These may be considered as machines which have to operate upon alimentary substances in very different conditions of mechanical and chemical combination, and to reduce them in every case to the same or precisely similar materials; and we might well imagine that the apparatus required to produce flesh and blood out of coarse fibrous vegetable substances would be different from that which had to produce exactly the same results out of ready-made flesh or blood; and in a very broad sense we find that this is so. If we take a large number of carnivorous animals, belonging to different fundamental types, and a large number of herbivorous animals, and strike a kind of average of each, we shall find that there is, pervading the first group, a general style, if we may use the expression, of the alimentary organs, different from that of the others. There is a specially carnivorous and a specially herbivorous modification of these parts. But, if function were the only element which has guided such modification, it might be inferred that, as one form must be supposed to be best adapted and most perfect in its relation to a particular kind of diet, that form would be found in all the animals consuming that diet. But this is far from being the case. The horse and the ox, for instance, two animals whose food in the natural state is precisely similar, are yet most different as regards the structure of their alimentary canal, and the processes involved in the preparation of that food. Again, the seal and the porpoise, both purely fish-eaters, which seize and swallow and digest precisely the

same kind of prey in precisely the same manner, have a totally different arrangement of the alimentary canal. If the seal's stomach is adapted in the best conceivable manner for the purpose it has to fulfill, why is not the porpoise's stomach an exact facsimile of it, and *vice versa*? We can only answer, the seal and porpoise belong to different natural groups of animals, formed on different primitive types, or descended from differently constructed ancestors. On this principle only can we account for the fact that, whereas, owing to the comparatively small variety of the different alimentary substances met with in nature, few modifications would appear necessary in the organs of digestion, there is really endless variety in the parts devoted to this purpose.

Circulatory, Absorbent, Respiratory, and Urinary Systems.—The blood of mammals is always red, and during the life of the animal hot, having a nearly uniform temperature, varying within a few degrees on each side of 100° Fahr. The corpuscles are, as usual in vertebrates, of two kinds—(1) colorless, spheroidal, nucleated, and exhibiting amoeboid movements; while (2) the more numerous, on which depends the characteristic hue of the fluid in which they are suspended, are colored, non-nucleated, flattened, slightly biconcave disks, with circular outline in all known species except the camels and llamas, where they have the elliptical form characteristic of the red corpuscles of nearly all the other vertebrates, though adhering to the mammalian type in absence of nucleus and relatively small size.

The heart of mammals consists of four distinct cavities, two auricles and two ventricles. Usually the ventricular portion is externally of conical form, with a simple apex, but in the *Sirenia* it is broad and flattened, and a deep notch separates the apical portion of each ventricle. A tendency to this form is seen in the *Cetacea* and the seals.

The *absorbent or lymphatic system* of vessels is very completely developed in the *Mammalia*. Its ramifications extend through all the soft tissues of the body, and convey a colorless fluid called lymph, containing nucleated corpuscles, and also, during the process of digestion, the chyle, a milky fluid taken up by the lymphatics (here called lacteals) of the small intestine, and pour them into the general vascular system, where they mix with the venous blood.

Respiratory Organs.—Mammals breathe occasionally through the mouth, but usually, and in many cases exclusively, through the nostrils or nares. The narial passages have the organ of smell situated in their upper part, and communicate posteriorly with the pharynx, and through the glottis with the "trachea" or wind-pipe, a tube by which the air is conveyed to and from the lungs.

The upper end of the trachea is modified into the organ of voice or "larynx," the air passing through which to and from the lungs is made use of to set the edges of the "vocal cords," fibrous bands stretched one on each side of the tube, into vibration.

The thoracic cavity of mammals differs from that of the *Sauropsida* in being completely separated from the abdomen by a muscular partition, the "diaphragm," attached to the vertebral column, the ribs, and the sternum. This is much arched, with the convexity toward the thorax, so that when its fibers contract it is flattened and the cavity of the thorax increased, and when they are relaxed the cavity is diminished. The lungs are suspended freely in the thorax, one on each side of the heart, being attached only by the root, which consists of the bronchus or air-tube, and pulmonary arteries and veins by which the blood is passed backward and forward between the heart and the lungs.

Urinary Organs.—The kidneys of mammals are more compact and definite in form than in other vertebrates, being usually more or less oval, with an indent on the side turned toward the middle line from and into which the vessels and ducts pass. In all mammals except the monotremes the ureters terminate by slit-like valvular openings in the urinary bladder. This receptacle when filled discharges its contents through the single median urethra, which in the male is almost invariably included in the penis, and in the females of some species of rodents, insectivores, and lemurs has a similar relation to the clitoris.

Nervous System and Organs of Sense.—The brain of mammals shows a higher condition of organization than that of other vertebrates. The cerebral hemispheres have a greater preponderance compared to other parts, especially to the so-called optic lobes, or corpora quadrigemina, which are completely concealed by them.

The twelve pairs of cranial nerves generally recognized in vertebrates are all usually found in mammals, though the olfactory nerves are excessively rudimentary, if not altogether absent, in the toothed whales. The spinal cord, or continuation of the central nervous axis, lies in the canal formed by the neural arches of the vertebrae, and gives off the compound double-rooted nerves of the trunk and the extremities corresponding in number to the vertebrae, through the interspaces between which they pass out to their destination.

The sense of touch is situated in the skin generally, but is more acute in certain regions more or less specialized for the purpose by the presence of tactile papillae, such as portions of the face, especially the lips and end of the snout, and the extremities of the limbs when these are used for other purposes than mere progression, and the under surface of the end of the tail in some monkeys.

The organs of the other special senses are confined to the head. Taste is situated in the papillae scattered on the dorsal surface of the tongue. The organ of smell is present in all mammals except the toothed whale.

The organ of sight is quite rudimentary, and even concealed beneath the integument, in some burrowing rodents and insectivores, and is most imperfectly developed in the *Platanista*, or freshwater dolphin of the rivers of India. In all other mammals the eyeball has the structure characteristic of the organ in the higher *Vertebrata*, consisting of parts through which the rays of light are admitted, regulated, and concentrated upon the sensitive expansion of the optic nerve lining the posterior part of the ball.

The organ of hearing is inclosed in a bony capsule (periotic) situated in the side of the head, intercalated between the posterior (occipital) and the penultimate (parietal) segment of the skull.

Reproductive Organs.—In the male the testes retain nearly their primitive or internal position throughout life in the *Monotremata*, *Sirenia*, *Cetacea*, most *Edentata*, *Hyracoidea*, *Proboscidea*, and seals, but in other orders they either periodically (as in *Rodentia*, *Insectivora*, and *Chiroptera*) or permanently pass out of the abdominal cavity through the inguinal canal, forming a projection beneath the skin of the perineum, or becoming suspended in a distinct pouch of the integument called scrotum. The penis is almost always completely developed, consisting of two corpora cavernosa attached to the ischial bones, and of a median corpus spongiosum inclosing the urethra, and forming the glans at the distal portion of the organ.

In the female, the ovaries retain permanently their original abdominal position, or only descend a short distance into the pelvis. They are of comparatively

smaller size than in other vertebrates, and have a definite flattened oval form, and are inclosed in a more or less firm "tunica albuginea." The oviduct has a trumpet-like, and usually fimbriated abdominal aperture, and is more or less differentiated into three portions—(1) a contracted upper part, called in man and the higher mammals "fallopian tube;" (2) an expanded part with muscular walls, in which the ovum undergoes the changes by which it is developed into the foetus, called the "uterus;" (3) a canal, the "vagina" separated from the last by a valvular aperture, and terminating in the urino-genital canal, or common urinal and genital passage, which in higher mammals is so short as scarcely to be distinct from the last.

Mammary glands, which secrete the milk by which the young are nourished during the first portion of their existence after birth, are present in both sexes in all mammals, though usually only functional in the female.

Secondary sexual characters, or modifications of structure peculiar to one sex, but not directly related to the reproductive function, are very general in mammals. They almost always consist of the acquisition or perfection of some character by the male as it attains maturity, which is not found in the female or young of either sex. In a large number of cases these clearly relate to the combats in which the males of many species engage for the possession of the females during the breeding season; others are apparently ornamental, and of many it is still difficult to apprehend the meaning.

One of the most certain and fundamental points in the classification of the *Mammalia* is, that all the animals now composing the class can be grouped primarily in three natural divisions, which, presenting very marked differentiating characters, and having no existing, or yet certainly demonstrated extinct, intermediate or transitional forms, may be considered as subclasses of equal value, taxonomically speaking, though very different in the numbers and importance of the animals at present composing them. These three groups are often called by the names originally proposed for them by De Blainville—(1) *Ornithodelphia*, (2) *Didelphia*, (3) *Monodelphia*—the first being equivalent to the order *Monotremata*, the second to the *Marsupiala*, and the third including all the remaining members of the class. Although actual palaeontological proof is wanting, there is much reason to believe that each of these, as now existing, are survivors of distinct branches to which the earliest forms of mammals have successively given rise, and for which hypothetical branches Huxley has proposed the names of *Prototheria*, *Metatheria*, and *Eutheria*, names which, being far less open to objection than those of Blainville, we shall here use as equivalents for the latter.

The characters of the *Prototheria* can only be deduced from the two existing families, as hitherto no extinct animals which can be referred to other divisions of this remarkable and well-characterized group have been discovered. These two isolated forms, in many respects widely dissimilar, yet having numerous common characters which unite them together and distinguish them from the rest of the *Mammalia*, are the *Ornithorhynchidae* and the *Echidnidae*, both restricted in their geographical range to the Australian region of the globe. Taken altogether they represent the lowest type of evolution of the mammalian class, and most of the characters in which they differ from the other two subclasses tend to connect them with the inferior vertebrates, the *Sauropsida* and *Amphibia*; for, though the name *Ornithodelphia* owes its origin to the resemblance of the structure of the female reproductive organs to those of birds, there is nothing especially bird-like about them.

Their principal distinctive characters are these:—The

brain has a very large anterior commissure, and a very small corpus callosum, agreeing exactly in this respect with the next group. The cerebral hemispheres, in *Echidna* at least, are well developed and convoluted on the surface. The auditory ossicles present a low grade of development, the malleus being very large, the incus small, and the stapes columelliform. They have no true teeth, though the jaws of *Ornithorhynchus* are provided with horny productions, which functionally supply their place. The coracoid bone is complete, and articulates with the sternum, and there is a large "interclavicle" or episternum in front of the sternum, and connecting it with the clavicles. There are also "epipubic" bones. The oviducts (not differentiated into uterine and fallopian portions) are completely distinct, and open as in oviparous vertebrates separately into a cloacal chamber, and there is no distinct vagina. The testes of the male are abdominal in position throughout life, and the vasa deferentia open into the cloaca, not into a distinct urethral passage. The penis, attached to the ventral wall of the cloaca, is perforated by a canal in the greater part of its length, but not at the base, which is open as in reptiles and those birds which have such an organ, and brought only temporarily in contact with the termination of the vasa deferentia, so as to form a seminal urethra when required, but never transmits the urinary secretion. This condition is a distinct advance on that of the *Sauropsida* in the direction of the more complete development of these parts in most of the other *Mammalia*. The ureters do not open into the bladder, but behind it into the dorsal wall of the genito-urinary passage. The mammary glands have no distinct nipple, but pour out their secretions through numerous apertures in the skin. The early stages of the development of the young are not yet fully known, but they are produced in a very rudimentary condition, and appear never to be nourished by means of an allantoic placenta.

The *Metatheria* or *Didelphia* are represented at present by numerous species, presenting great diversities of general appearance, structure, and habits, although all united by many essential anatomical and physiological characters, which, taken altogether, give them an intermediate position between the *Prototheria* and the *Eutheria*.

The *Eutheria*, *Monodelphia*, or "placental mammals" (so called because the fetus is always nourished while within the uterus of the mother by means of an allantoic placenta) include at present by far the greater proportion of the class. While the survivors of the other groups have probably been for a long time in a stationary condition, these have, as there is already good evidence to show throughout all the Tertiary geological age, and by inference for some time before, been multiplying in numbers and variations of form, and attaining higher stages of development and specialization in various directions. They consequently exhibit far greater diversity of external or adaptive modification than is met with in either of the other subclasses—some being fitted to live as exclusively in the water as fishes, and others to emulate the aerial flight of birds.

To facilitate the study of the different component members of this large group, it is usual to separate them into certain divisions which are called "orders." In the main zoologists are now of accord as to the general number and limits of these divisions among the existing forms, but the affinities and relationships of the orders to one another are far from being understood, and there are very many extinct forms already discovered which do not fit at all satisfactorily into any of the orders as commonly defined.

Commencing with the most easily distinguished, we

may first separate a group called *Edentata*, composed of several very distinct forms, the sloths, anteaters, and armadillos, which under great modifications of characters of limbs and digestive organs, as well as habits of life, have just enough in common to make it probable that they are the very specialized survivors of an ancient group, most of the members of which are extinct, but which the researches of palæontology have not yet revealed to us. The characters of their cerebral, dental, and in many cases of their reproductive organs show an inferior grade of organization to that of the generality of the subclass. The next order, about the limits of which there is no difficulty, is the *Sirenia*, aquatic vegetable-eating animals, with complete absence of hind limbs, and low cerebral organization—represented in our present state of knowledge by but two existing genera, the dugongs and manatees, and by a few extinct forms, which, though approaching a more generalized mammalian type, show no special characters allying them to any of the other orders. Another equally well-marked and equally isolated, though far more numerous represented and diversified, order, is that of the *Cetacea*, composed of the various forms of whales, dolphins, and porpoises. In aquatic habits, external fish-like form, and absence of hind limbs they resemble the last, though in all other characters they are as widely removed as are any two orders among the *Eutheria*. The association by systematists of the *Cetacea* and *Sirenia* in one group can only be made either in ignorance of their true structure, or in an avowedly artificial system.

All the remaining orders are more nearly allied together, the steps by which they have become modified from one general type being in most cases not difficult to realize. Their dentition especially, however diversified in detail, always responds to the formula already described; and, although the existing forms are broken up into groups in most cases easy of definition, the discoveries already made in palæontology have in great measure filled up the gaps between them.

Very isolated among existing *Eutheria* are the two species of elephant constituting the order called *Proboscidea*. These, however, are now known to be the survivors of a large series of similar animals, mammoths, mastodons, and *Dinotheria*, which, as we pass backward, in time gradually assume a more ordinary or generalized type; and the interval which was lately supposed to exist between even these and the rest of the class is partially bridged over by the discovery in American Eocene and early Miocene formations of the gigantic *Dinocerata*, evidently offshoots of the great group of hoofed animals, or *Ungulata*, represented in the actual fauna by the horses, rhinoceroses, tapirs, swine, and ruminants. Almost as isolated as the *Proboscidea* among existing mammals are the few small species constituting the genus *Hyrax*, and in their case palæontology affords no help at present, and therefore, pending further discoveries, it has been thought advisable in most recent systems to give them the honor of an order to themselves, under the name of *Hyracoidea*. But the number of extinct forms already known allied to the *Ungulata*, but not coming under the definition of either of the two groups (*Artiodactyla* and *Perrissodactyla*) under which all existing species range themselves, is so great that either many new orders must be made for their reception or the definition of the old order *Ungulata* so far extended as to receive them all, in which case both *Proboscidea* and *Hyracoidea* might be included within it. Again the *Rodentia*, or gnawing animals—rabbits, rats, squirrels, porcupines, beavers, etc.—are, if we look only at the present state of the class, most isolated. No one can doubt what is meant by a rodent animal, or have any difficulty about defining it clearly, at least by its

dental characters; yet our definitions break down before the extinct South American *Mesotherium*, half rodent and half ungulate, which leads by an easy transition to the still more truly ungulate toxodon, for the reception of which a distinct order (*Toxodontia*) has been proposed. The *Insectivora* and the *Carnivora* again are at present quite distinct orders, but they merge into one another through fossil forms, and are especially connected by the large group of primitive *Carnivora* so abundantly represented in the Eocene deposits of both America and Europe, to which Cope has given the name of *Creo-donta*. The transition from the insectivores to the lemurs is not great, and, strange to say, however different they now appear, the early forms of lemurs are not easily distinguished from the primitive ungulates. The bats or *Chiroptera* are allied to the *Insectivora* in all characters but the extraordinary modification of their anterior extremities into wings, but this, like the want of the hind limbs in the *Cetacea* and *Sirenia*, makes such a clear distinction between them and all other mammals that, in the absence of any knowledge of intermediate or transitional forms, they can be perfectly separated, and form as well defined an order as any in the class. Lastly, we have the important and well-characterized group, called *Primates*, including all the monkeys and man, and the question is not yet solved as to how and through what forms it is linked on to the other groups. It is commonly assumed that the lemurs are nothing more than inferior *Primates*, but the interval between them in the actual fauna of the world is very great, and our knowledge of numerous extinct species recently discovered in America, said to be intermediate in characteristics, is not yet sufficiently perfect to enable us to form a definite opinion upon the subject.

The existing species of few classes of the animal kingdom are better known than those of the *Mammalia*, and, owing to the comparatively limited methods of locomotion or transport which most of them possess, the area of distribution of each species is more definite and restricted than in some other classes. In the articles *BIRDS* and *DISTRIBUTION* the various regions into which naturalists have divided the earth's surface, according to the prevailing characteristics of its animal inhabitants, have been described, and in the latter the main facts connected with the distribution of mammals have been treated of. In the account of each group contained in the present article the particular circumstances relating to its geographical range will be mentioned. There is little therefore needed here, except a brief summary of the most important facts relating to this interesting subject.

As regards their distribution over the surface of the earth, mammals may be divided into three groups according to their principal methods of locomotion—(1) aerial, (2) aquatic, and (3) terrestrial.

1. *Aërial Mammals*.—This group only comprises the animals composing the single order *Chiroptera*, which differ from all other mammals in the fact that their principal means of transport from place to place is by aerial flight, as in the majority of birds and insects. Broad expanses of water, which form natural barriers to the spread of terrestrial mammals, are therefore no obstacles to their distribution; accordingly we find the general rule that mammals are not inhabitants of oceanic islands modified in their case. But even in this group, notwithstanding their exceptional powers of locomotion, different species, genera, and families inhabit very definite areas. Each zoological region of the earth has its characteristic bats; and those of the New World and of the Old World are, with very few exceptions, quite distinct.

2. *Aquatic Mammals*.—Many mammals grouped for the present purpose as terrestrial pass a great portion of their lives in brooks, lakes, or rivers, and, being dependent upon such waters for obtaining their subsistence, are necessarily confined to their vicinity; but the truly aquatic mammals, or those living constantly in the water, and unable to move their quarters from place to place by land, are the orders *Cetacea* and *Sirenia*, with which may also be grouped the seals, forming the Pinniped division of the order *Carnivora*.

For the marine *Cetacea*, animals mostly of large size and endowed with powers of rapid locomotion, there are obviously no barriers to universal distribution over the surface of the earth covered by sea, except such as are interposed by uncongenial temperature or absence of suitable food.

The great sperm whale (*Physeter macrocephalus*) is known to be almost cosmopolitan, inhabiting or passing through all the tropical and temperate seas, although not found near either pole. At least three of the well-known species of porpoise (*Balanoptera*) of the British coasts are represented in the North Pacific, on the South American shores, and near New Zealand by species so closely allied that it is difficult to point out any valid distinctive characters, though it may perhaps be desirable to wait for a more complete examination of a large series of individuals before absolutely pronouncing them to be specifically identical. There is nothing yet known by which we can separate the "humpback whales" (*Megaptera*) of Greenland, the Cape of Good Hope, and Japan. The same may be said of the common dolphin of the European seas (*Delphinus delphis*) and the so-called *D. bairdii* of the North Pacific, and *D. forsteri* of the Australian seas. The pilot whale (*Globicephalus melas*) and the *Pseudorca* of the North Atlantic and of New Zealand are also precisely alike, as far as present knowledge enables us to judge. Many other similar cases might be given. Captain Maury collected much valuable evidence about the distribution of the larger *Cetacea*, and, finding right whales (*Balena*) common in both northern and southern temperate seas, and absent in the intermediate region, laid down the axiom that "the torrid zone is to the right whale as a sea of fire, through which he cannot pass." Hence all cetologists have assumed that the right whale of the North Atlantic (*B. biscayensis*), that of the South Seas (*B. australis*), and that of the North Pacific (*B. japonica*) are necessarily distinct species. The anatomical structure and external appearance of all are, however, as far as yet known, marvelously alike, and, unless some distinguishing characters can be pointed out, it seems scarcely justifiable to separate them upon geographical position alone; as, although the tropical seas may be usually avoided by them, it scarcely seems impossible, or even improbable, that some individuals of animals of such size and rapid powers of swimming may have at some time traversed so small a space of ocean as that which divides the present habitual localities of these supposed distinct species. If identity or diversity of structural characteristics is not to be allowed as a test of species in these cases, as it is usually admitted to be in others, the study of their geographical distribution becomes an impossibility.

Although many species are thus apparently of such wide distribution, others are certainly restricted; thus the Arctic right whale (*Balena mysticetus*) has been conclusively shown to be limited in its range to the region of the northern circumpolar ice, and no corresponding species has been met with in the southern hemisphere. In this case, not only temperature, but also the peculiarity of its mode of feeding, may be the cause. The narwhal and the beluga have a very similar distri-

bution, though the latter occasionally ranges farther south. The Hyperoodons are restricted to the North Atlantic, never entering, as far as is yet known, the tropical seas. Other species are exclusively tropical or austral in their range. One of the true whalebone whales (*Neobalena marginata*) has only been met with hitherto in the seas round Australia and New Zealand, a large Ziphioid (*Berardius arnouxii*) only near the last-named islands.

The *Cetacea* are not limited to the ocean, or even to salt water, some entering large rivers for considerable distances, and some being exclusively fluviatile.

The great difference in the manner of life of the *Sirenia*, as compared with that of the *Cetacea*, causes a corresponding difference in their geographical distribution. Slow in their movements, and feeding exclusively upon vegetable substances, water-grasses, or fuci, they are confined to rivers, estuaries, or coasts where they grow, and are not denizens of the open sea, although of course there is a possibility of accidental transport by the assistance of oceanic currents across considerable distances.

The Pinnipeds, although capable of traversing long reaches of ocean, are less truly aquatic than the last two groups, always resorting to the land or to extensive ice-floes for the purpose of breeding. The geographical range of each species is generally more or less restricted, usually according to climate, as they are mostly inhabitants of either the Arctic or Antarctic seas and adjacent temperate regions, very few being found within the tropics.

3. *Terrestrial Mammals*.—One of the most important facts connected with the present distribution of terrestrial mammals, but one of which the cause is sufficiently obvious, is their entire absence, except where introduced by the direct agency of man, from all oceanic islands, including even the great New Zealand group. Another, equally striking, but less easily explained, is the very marked isolation as regards its mammalian fauna of the Australian region of zoologists. When once the narrow neutral ground on the border line between this and the Oriental region is passed, there is not found, notwithstanding the vast extent of land it comprises, a single indigenous placental or monodelphous mammal, except a few species of a single family (*Muridae*) of the very widespread order *Rodentia*—the wild dog or dingo having been in all probability introduced. On the other hand, the members of the other two subclasses, the *Prototheria* or *Ornithodelphia* and the *Metatheria* or *Didelphia*, are almost entirely restricted to this region. It might have been said entirely, but for the presence of one family (*Didelphidae*) of the latter group in America.

The *Eutheria* or *Monodelphia* are distributed throughout the remaining geographical regions, as described in the article DISTRIBUTION, and in many cases form valuable indications by which the natural boundaries of these divisions have been traced.

HISTORY OF THE MAMMALIA IN PAST TIMES.

As already intimated, such knowledge as we yet possess of the history of mammals in past times is of very recent growth, and is still extremely incomplete. The very rapid advances which have been made in the last few years, especially in consequence of the explorations of rich fossiliferous beds in North America, have not only completely changed the present aspect of the science, but give such promise for the future that any sketch which we might now attempt of this branch of the subject could only be regarded as representing a transient phase of knowledge. It will be well, however, to gather together in this place the leading facts

now ascertained with regard to the most ancient forms, as, owing to the uncertainty of their relationship with any of the existing orders, they will be most conveniently treated of separately, while the ascertained facts relating to the geological history of the forms more nearly allied to those now living will be more appropriately described under the account of the different groups into which the class may now be divided.

MAMMALS OF THE MESOZOIC PERIOD.

The hitherto discovered remains of mammals which existed anterior to the Tertiary period all belong to creatures of very small size, the largest scarcely exceeding the common polecat or squirrel. Some are known only by a few isolated teeth, others by nearly complete sets of these organs, and the majority by more or less perfect specimens of the rami of the lower jaw. It is a very curious circumstance that this part of the skeleton alone has been preserved in such a large number of instances. No complete cranium has ever been found, nor is there satisfactory evidence of the structure of the vertebral column or of the limbs of any single individual. The species already described from European strata amount to nearly thirty, which have been arranged in fifteen genera. Of these by far the greater number have been found at a single spot near Swanage in Dorsetshire, in a bed of calcareous mud only forty feet long, ten feet wide, and averaging five inches in depth. The marvelous results obtained by the exploration by Mr. S. H. Beckles of this small fragment of the earth's surface show by what accidents, as it were, our knowledge of the past history of life has been gained, and what may still remain in store where little thought of at present. A bed, apparently equally rich, has recently been discovered in the Territory of Wyoming, the contents of which are being made known by Professor Marsh.

1. *Mammals of the Triassic Period*.—The Rhaetic formations, so named from the Rhetian Alps of Bavaria, are the highest beds of the Trias, and are situated above the New Red Sandstone, and just below the Lias. In 1847 Professor Pleininger of Stuttgart, while assiduously sifting some sand from this formation, belonging to the Keuper of Diegerloch and Steinenbronn, discovered, among an immense mass of teeth, scales, and unrecognizable fragments of skeletons of fish and saurians, two minute teeth, each with well-defined, enameled, tuberculated crowns and distinct roots, plainly showing their mammalian character. These, the oldest known evidence of the class, were considered by their discoverer to indicate a predaceous and carnivorous animal of very small size, to which he gave the name of *Microlestes antiquus*. Subsequently Mr. C. Moore discovered in a bone bed of Rhaetic age filling a fissure in the mountain limestone at Holwell, near Frome, in Somersetshire, various isolated teeth with their crowns much worn, but apparently including both upper and lower molars and a canine, which are assigned by Professor Owen to Pleininger's genus *Microlestes*, and described specifically as *M. moorei*. Under the name of *Hypsiprymnopsis rhaeticus* Prof. Boyd Dawkins has described a single tooth with two roots which he discovered in a Rhaetic marlstone at Watchet, in Somersetshire, and which may be even somewhat older than the last. Professor Dawkins finds the nearest analogue of this tooth among recent mammals in the large trenchant premolar of the rat-kangaroo, or *Hypsiprymnus*, a resemblance not concurred in by Professor Owen, who refers it to the genus *Microlestes*. The minute size and worn condition of the tooth render it extremely difficult to form a decided opinion upon its characteristics, and therefore upon the affinities of the animal to which it belonged.

Still more satisfactory evidence of the presence of mammals at a period at least as ancient as the European Trias is afforded by the discovery of three nearly perfect mandibular rami in the Gatham coal-field of North Carolina by Doctor Emmons, who, however, placed them as far back in age as the Permian, or altogether beyond the Mesozoic stage, a conclusion not now received. Of this animal, called *Cromatherium sylvestre*, the complete dentition of the lower jaw is known, and consists of three pointed incisors, separated by intervals, one canine, and ten molars, of which the first three have simple sub-compressed crowns, and the remainder are multicuspid. The jaw figured by Doctor Emmons is nine-tenths of an inch in length. He considered it to belong to a placental insectivore, but the number of molar teeth exceeds that of any existing member of that order, and is only found in some marsupials. It was associated in the same bed with thecodont reptiles.

2. *Mammals of the Jurassic Period.*—In the ascending order of geological age the next remains of mammals have been met with in the Lower Oolite at Stonesfield, in Oxfordshire, where they are associated with wing cases of insects, plesiosaurs, crocodiles, and pterodactyles. From this bed several specimens have been met with at various times, which have been placed in three genera.

A. *Amphitherium*, Blainville, 1838. The specimen upon which this genus was founded was discovered in 1812, and examined in 1818 at Oxford by Cuvier, who pronounced it to be mammalian, and to resemble the jaw of an opossum. This conclusion was afterward disputed by De Blainville and others, who believed it to be a reptilian, but the original determination is now generally accepted. Three rami of mandibles, all more or less perfect, are now known. The length of the jaw is rather less than an inch. It contains sixteen teeth, which, as defined by shape only, are—*i* 3, *c* 1, *p* 6, *m* 6, so that if the upper jaw had a corresponding number there would be sixty-four teeth in all—a greater number than in any existing heterodont mammal, though equaled by some of the species from the Purbeck. The nearest approach to this number is in *Myrmecobius* among recent marsupials. The incisors are rather long and slender, the canines apparently not much larger than the incisors, all the premolars and molars two-rooted—the former with a single large pointed cusp and small basal cusp on one or both sides, the latter quincuspidate. The lower margin of the angular process is slightly inflected, and the mylohyoid groove persistent, as in some of the existing marsupials and in whalebone whales. This groove, a remnant of that which originally lodges Meckel's cartilage, mistaken for a suture, was once considered evidence of the reptilian nature of these jaws. A second species is described as *A. broderipii* (Owen).

B. *Phascalotherium*, Owen, 1839. This is founded on a right ramus of the lower jaw, presenting the inner side to view. Its length is 1.4 inch. The number of teeth resemble those of existing insectivorous mammals, being *i* 3 or 4, *c* 1, *p* and *m* 7, but not clearly defined from each other. One species, *P. bucklandii*.

C. *Stereognathus*, Charlesworth, 1854. *S. ooliticus* is founded on a fragment of a jaw of minute size with three molar teeth *in situ*. The grinding surface is of quadrate form, of very little height, and supports six subequal cusps. Its affinities are quite problematical.

The freshwater bed previously alluded to, situated at Durdlestone Bay, near Swanage, belongs to the Middle Purbeck series, intervening between the Middle Oolite and the Wealden. The first discovery of mammalian bones was made in this spot by Mr. W. R. Brodie in

1854, but the subsequent explorations by Mr. S. H. Beckles have yielded a surprising number of species. They are associated with numerous saurians, insects, and freshwater shells, as *Paludina*, *Planorbis*, and *Cyclas*. No less than eleven genera from this locality alone are fully described in Professor Owen's memoir. These may be grouped as follows:—

A. With teeth arranged on the insectivorous type. Mandibular incisors more than two; canines well developed; premolars and molars cuspidate, seven or more:—(a) molars and premolars more than eight, mostly twelve (*Spalacotherium*, *Amblotherium*, *Peralestes*, *Achyrodon*, *Peraspalax*, *Peramus*, *Stylodon* and *Bolodon*—the last known only by the maxillary); (b) molars and premolars seven or eight (*Triconodon* and *Triacanthodon*). As any synopsis of the characteristics of these genera would be scarcely intelligible without minute descriptions and reference to figures, the reader who desires further information is referred to the memoir cited above.

B. With a single, strong, pointed, slightly curved incisor, placed close to the median line as in rodents. No canine. Three or four compressed, trencant, obliquely grooved premolars, increasing in size from first to last, and two small molars with low multituberculated crowns. Genus *Plagiaulax*, Falconer. This remarkable and highly specialized type has been the occasion of one of the most interesting discussions on the inferences which may be drawn as to the affinities and habits of an otherwise unknown animal from the structure of a small portion of its organism which occurs in the annals of natural history, a discussion carried on with great ability, ingenuity, and wealth of illustration on both sides. Doctor Falconer maintained that it was more nearly allied to the rat-kangaroo (*Hypsiprymnus*) than to any other existing form, and that, as it is known that these animals feed upon grass and roots, "it may be inferred of *Plagiaulax* that the species were herbivorous or frugivorous. I can see nothing in the character of their teeth," he adds, "to indicate that they were either insectivorous or omnivorous." Professor Owen, on the other hand, from the same materials came to the conclusion that "the physiological deductions from the above-described characteristics of the lower jaw and teeth of *Plagiaulax* are that it was a carnivorous marsupial. It probably found its prey in the contemporary small insectivorous mammals and lizards, supposing no herbivorous form like *Stereognathus* to have coexisted during the Upper Oolite period. It is impossible here to give at any length the arguments by which these opposing views are respectively supported, but it may be indicated that the first-mentioned is strongly countenanced by the consideration of the following facts:—(1) All existing marsupials may be divided, as far as their dentition is concerned, into two groups—(a) those which have a pair of large more or less procumbent incisors close to the symphysis of the lower jaw, and rudimentary or no canines (diprotodont dentition; families *Phascotomyidae*, *Macropodidae*, and *Phalangistidae*); and (b) those which have numerous small incisors, and large pointed canines (polyprotodont dentition; families *Peramelidae*, *Dasyuridae*, and *Didelphidae*); (2), the vast majority of the former group are purely vegetable feeders, and almost all of the latter are carnivorous or insectivorous; and (3) *Plagiaulax*, so far as its structure is known belongs obviously to the former group, and, as we have no sure basis for inferences as to the habits of an unknown animal but the knowledge of the habits of such as are known, we have no ground for supposing that its habits differed from those of its structural congeners.

That the two types of dentition still found among

marsupials should have existed side by side in so remote a period of time as that in which the Purbeck bone bed was deposited, and that one of these types should have already attained so singular a degree of specialization, is one of the most remarkable facts yet revealed by mammalian palæontology. Whether the teeth of the upper jaw correspond also to the modern diprotodont type is a question of great interest, for the solution of which we must await future discoveries, of which we have more hope since the announcement by Professor Marsh of the existence, in considerable numbers, of small mammals in the American Jurassic formations of the Rocky Mountains, which conform in all their general characters to those of the English Purbecks, some being even considered to be generally identical. Both polyprotodont and diprotodont types are represented, the latter by a species called by its discoverer *Ctenacodon serratus*, very closely allied to *Plagiaulax*.

It will be of very great interest to know the mode of succession of the teeth of those early mammals, as it may throw some light upon the question of the relation of the succession of teeth in mammals generally with the same process in the inferior classes of the *Vertebrata*. There is, however, as yet very little, if any, reliable evidence upon the subject, but such as there is rather points to the fact of an absence or very feeble development of the diphyodont condition, resembling that of modern marsupials. If this is so, it may lead to the somewhat startling conclusion that in the transition from the lower vertebrate to the mammal, by whatever process it took place, the indefinite reproduction of the teeth of the former was lost, and that a monophyodont condition supervened, which was again superseded by the peculiar definite diphyodont mode of succession characteristic of the most highly organized mammals.

There is nothing yet known in the structure of these small mammals of the Mesozoic ages of the world to connect them with the surviving representatives (the monotremes) of the hypothetical *Prototheria*; but whether their position was among the *Metatheria* or *Eutheria*, or whether they represented generalized forms from which both these branches have been derived, it is impossible at present to say. To avoid the difficulty of endeavoring to find places for them in any of the existing groups, Marsh proposes to found two new orders for their reception—*Prototheria* for those of the polyprotodont or insectivorous type of dentition, and *Allotheria* for *Plagiaulax* and its allies. The former may be convenient, but it is scarcely advisable to separate the latter ordinarily, as long as we continue to place *Phascolomys* and *Thylacinus*, *Chiomys* and *Lemur*, *Trichecus* and *Phoca* in the same orders, for *Plagiaulax* and *Amphitherium* do not differ in the characteristics of their jaws and teeth more than any of these examples, which show how much the dentition may be modified with comparatively little general diversity of structure.

This scanty evidence of mammalian life must bear a very small proportion to that which doubtless existed during the greater part of the vast Mesozoic period. The Cretaceous formations have as yet yielded no trace of the presence of animals of this class; but the number and variety of species met with in the earliest Tertiary formations, when already differentiation into most of the existing leading divisions had taken place, strikingly proves the imperfect state of our geological record during the immediately antecedent ages of the world.

MAMMOTH, a name commonly given to one of the numerous extinct forms of Elephant, *Elephas primigenius*. Probably no animal which has not survived to the historic period has left such an abundant and well-preserved evidence of its former existence. The discovery

of immense numbers, not only, as in the case of most extinct creatures, in the form of fragmentary bones and teeth, but often as more or less entire carcasses, or "mummies" as they may be called, with the flesh, skin and hair *in situ*, in the frozen soil of the tundras of northern Siberia, has for a long time given great interest to the species.

The tusks or upper incisor teeth were doubtless present in both sexes, but probably of smaller size in the female. In the adult males they often attain the length of from nine to ten feet measured along the outer curve. Upon leaving the head they were directed at first downward and outward, then upward and finally inward at the tips, and generally with a tendency to a spiral form not seen in other species of elephant. Different specimens, however, present great variations in curve, from nearly straight to an almost complete circle.

The bones of the skeleton generally more resemble those of the Indian elephant than of any other known species, but the skull differs, in the narrower summit, narrower temporal fossæ, and more prolonged incisive sheaths, required to support the roots of the enormous tusks. Among the external characters by which the Mammoth was distinguished from either of the existing species of elephant was the dense clothing, not only of long, coarse outer hair, but also of close under woolly hair, of a reddish-brown color, evidently in adaptation to the colder climate which it inhabited. This characteristic, for a knowledge of which we are indebted to the well-preserved remains found in northern Siberia, is also represented in the rude but graphic drawings of prehistoric age, found in caverns in the south of France. In size different individuals varied considerably, but the average height does not appear to have exceeded that of either of the existing species of elephant.

The geographical range of the Mammoth was very extensive. There is scarcely a county in England in which some of its remains have not been found either in alluvial deposits of gravel or in caverns, and numbers of its teeth are from time to time dredged up from the bottom of the sea by the fishermen who ply their trade in the German Ocean, having been washed out of the water-worn cliffs of the eastern counties of England. In Scotland and Ireland its remains are less abundant, but they have been found in vast numbers at various localities throughout the greater part of central Europe (as far south as Santander in Spain and Rome), northern Asia, and the northern part of the American continent, though the exact distribution of the Mammoth in the New World is still a question of debate. It has not hitherto been met with in any part of Scandinavia or Finland.

In point of time, the Mammoth belongs exclusively to the post-Tertiary or Pleistocene epoch of geologists, and it was undoubtedly contemporaneous with man in France, and probably elsewhere.

MAMMOTH CAVE, in Edmondson county, Ky., eighty-five miles south-southwest of Louisville, was discovered, in 1809, by a hunter named Hutchins, while in pursuit of a wounded bear. Its mouth is in a forest ravine, 194 feet above Green river, and 600 feet above the sea. This aperture is not the original mouth, the latter being a chasm a quarter of a mile north of it, and leading into what is known as Dixon's Cave. The two portions are not now connected, though persons in one can make themselves heard by those in the other. Saltpeter was formerly made from the nitrous earth in which the cave abounded; but it is now mainly turned to account as a place of exhibition. The cavernous limestone of Kentucky covers an area of 8,000 square miles, is massive and homogeneous, and belongs to the Subcarboniferous period. It shows few traces of dynamic disturbance, but has been carved,

since the Miocene epoch, into many caverns, of which the Mammoth Cave is the noblest specimen known.

The natural arch that admits one to Mammoth Cave has a span of seventy feet, and from a ledge above it a cascade leaps fifty feet to the rocks below, where it disappears. A winding flight of stone steps leads the way down to a narrow passage, through which the air rushes with violence, outward in summer, and inward in winter. The temperature of the cave is uniformly 54° Fahr. throughout the year, and the atmosphere is both chemically and optically of singular purity. While the lower levels are moist from the large pools that have secret connection with Green river, the upper galleries are extremely dry. These conditions led, at one time, to the erection of thirteen cottages, at a point about one mile under ground, for the use of invalids, especially consumptives. The experiment ended in failure, and only two cottages now remain.

The Main Cave, from 40 to 300 feet wide, and from 35 to 125 feet high, has several vast rooms, e.g., the Rotunda, where are the ruins of the old saltpeter works; the Star Chamber, where the protrusion of white crystals through a coating of the black oxide of manganese creates an optical illusion of great beauty; the Chief City, where an area of two acres is covered by a vault 125 feet high, and the floor is strewn with rocky fragments, among which are found numerous half-burnt torches made of canes, and other signs of prehistoric occupancy. Two skeletons were exhumed near the Rotunda; but no other bones of any description have been found. The so-called Mammoth Cave "mummies" (i.e., bodies kept by being inhumed in nitrous earth), with accompanying utensils, ornaments, braided sandals, and other relics, were found in Short and Salt caves near by, and removed to Mammoth Cave for exhibition. The Main Cave, which abruptly ends four miles from the entrance, is joined by winding passages, with spacious galleries on different levels; and, although the diameter of the area of the whole cavern is less than ten miles, the combined length of all accessible avenues is supposed to be about 150 miles.

The chief points of interest are arranged along two lines of exploration, besides which there are certain side excursions. The "short route" requires about four hours, and the "long route" nine.

Many small rooms and tortuous paths, where nothing of special interest can be found, are avoided as much as possible on the regular routes; but certain disagreeable experiences are inevitable. There is peril also in the vicinity of the deep pits. The one known as the Bottomless Pit was for many years a barrier to all further exploration, but is now crossed by a wooden bridge. Long before the shaft had been cut as deep as now, the water flowed away by a channel gradually contracting to a serpentine way, so extremely narrow as to be called the Fat Man's Misery. The walls, only eighteen inches apart, change direction eight times in 105 yards, while the distance from the sandy path to the ledge overheard is but five feet. The rocky sides are finely marked with waves and ripples, as if running water had suddenly been petrified. This winding way conducts one to River Hall, beyond which lie the crystalline gardens that have been described. It used to be said that, if this narrow passage were blocked up, escape would be impossible; but lately an intricate web of fissures, called the Corkscrew, has been discovered, by means of which a good climber, ascending only a few hundred feet, lands 1,000 yards from the mouth of the cave, and cuts off one or two miles.

The waters, entering through numerous domes and pits, and falling, during the rainy season, in cascades of great volume, are finally collected in River Hall, where

they form several extensive lakes, or rivers, whose connection with Green river is known to be in two deep springs appearing under arches on its margin. Whenever there is a freshet in Green river the streams in the cave are joined in a continuous body of water, the rise sometimes being sixty feet above the low-water mark. The subsidence within is less rapid than the rise; and the streams are impassable for about seven months in each year. They are navigable from May to October, and furnish interesting features of cave scenery. The first approached is called the Dead Sea, embraced by cliffs 60 feet high and 100 feet long, above which a path has been made, whence a stairway leads to the banks of the River Styx, a body of water 40 feet wide and 400 feet long, crossed by a natural bridge. Lake Lethe comes next—a broad basin inclosed by walls 90 feet high, below which a narrow path leads to a poutoon at the neck of the lake. A beach of the finest yellow sand extends for 500 yards to Echo river, the largest of all, being from 20 to 200 feet wide, 10 to 40 feet deep, and about three-quarters of a mile long.

The fauna of Mammoth Cave has been classified by Putman, Packard, and Cope, who have catalogued twenty-eight species truly subterranean, besides those that may be regarded as stragglers from the surface. They are distributed thus:—*Vertebrata*, four species; *Insecta*, eleven; *Arachnida*, six; *Myriapoda*, two; *Crustacea*, two; *Vermes*, three. Ehrenberg adds a list of eight Polygastric *Infusoria*, one fossil infusorian, five *Phytolitharia*, and several microscopic fungi. The most interesting inhabitants of Mammoth Cave are the blind wingless grasshoppers, with extremely long antennæ, blind, colorless crayfish (*Cambarus pellucidus*, Telk.); and the blind fish, *Amblyopsis speleus*, colorless and viviparous, from one inch to six inches long. Fish not blind are occasionally caught, which are apparently identical with species existing in streams outside. The true subterranean fauna may be regarded as chiefly of Pleistocene origin; yet certain forms are possibly remnants of Tertiary life. The strongly marked divergence of these animals from those found outside convinced the elder Agassiz that they were specially created for the limits within which they dwell. But the opinion now held is that they are modified from allied species existing in the sunlight, and that their peculiarities may all be accounted for on principles of evolution—the process being accelerated (or retarded) by their migration from the outer world to a realm of absolute silence and perpetual darkness.

MAN. See ANTHROPOLOGY and the articles on the various contributory sciences there referred to.

MAN, ISLE OF, a dominion of the crown of England, situated in the Irish Sea, almost equidistant from England on the east, Scotland on the north, and Ireland on the west. Douglas, on the east coast of the island, is distant fifty-eight miles west-northwest from Fleetwood, while Peel, on the west coast, is sixty-five miles south-east of Belfast. The greatest length of the island is about thirty-three miles, and its greatest breadth about twelve miles. The total area is 145,325 acres, or about 227 square miles.

A mountain range occupies the larger portion of the island, the highest summits—Snaefell (2,024 feet), North Barrule (1,842), and Slieu Chairw (1,808)—are in the northwest. The fine scenery of the mountains has been made more accessible by the construction of a series of roads, commanding, at many points, views unsurpassed for picturesqueness and variety. Toward the south-eastern shore the mountains slope more gradually toward the sea, the coast of which is generally low and sandy, being indented by several finely-rounded bays, including Castletown Bay and Derby Haven. From Derby Haven

to Maughold Point the coast is frequently bold and rocky, and the numerous creeks and bays, the largest of which are Douglas Bay and Laxey Bay, greatly add to the variety of the scenery.

The most important minerals are lead, copper, and zinc. The principal mines are those of Laxey, near the Laxey river, which produce lead, copper, and especially sulphide of zinc, which forms more than two-thirds of the total quantity of ore raised from those mines. The galena obtained is very rich in silver. The Foxdale mines, between Castletown and St. John's, are also very largely wrought.

The mean annual temperature is higher than that of any other district occupying the same parallel of latitude, and the variation according to the seasons is remarkably small.

Owing originally to the enterprise of Scotch and English farmers, the land where arable has been brought into a state of high cultivation. Through the use of seaweed in large quantities in the northern districts of the island the sandy and gravelly soil has been greatly enriched, and it now possesses remarkable fertility, its productiveness being increased by the fine climate.

According to the agricultural returns of 1882, the cultivated area comprehended 97,494 acres, 67 per cent. of the whole.

Like Ireland, the Isle of Man is exempt from venomous reptiles and toads, a circumstance traditionally attributed to the agency of St. Patrick, the patron saint of both islands. Frogs are, however, found, and both the sand lizard and the common lizard are met with. Moles are absent, badgers are unknown, and foxes are now extinct. Fossil bones are frequently found of the Irish elk; and the red deer, as is proved by the references to it in old laws, and the representations of it on Runic monuments, was at one time common, although the species had almost disappeared about the beginning of the eighteenth century.

The government of the island is vested in a governor appointed by the crown, a council which acts as an upper chamber of the legislature, and the House of Keys. The governor and council and the House of Keys together constitute the court of Tynwald; but the approval of the queen of Great Britain in council is essential to every legislative enactment. Acts of the British legislature do not affect the island except it be specially named in them. For the purposes of civil jurisdiction the island is divided into a northern and a southern district, and each of these is again subdivided into three "sheadings," which are analogous to counties.

The laws of the island still retain much of their ancient peculiarity of character, though modified by acts of Tynwald, and rendered in some respects more in unison with those of England. The criminal law was consolidated and amended by the criminal code of 1872.

Christianity is said to have been introduced into the island by St. Patrick about the middle of the fifth century. The bishopric of Sodor (*i.e.*, Sudreys, the southern Hebrides) was formerly united with that of Man; and the union continued till the fourteenth century, the Manx bishops even now retaining the joint title Sodor and Man.

The population of the island (April 1, 1901) was 54,758. The principal towns of the island are Douglas, Castletown, Ramsey, and Peel.

The Manx language is a subdialect of the ancient Celtic, and a dialect of the Irish branch, to which the Scottish Gaelic also belongs. The differences in pronunciation of these languages are not so great as to prevent a native of either country conversing with one of the other, although the differences in orthography perplex even the most learned linguists. The Manx is

now spoken only in the northwestern parishes, and at a few localities along the western coast. The natives generally converse in the English language. Manx is not taught in any of the schools, and it is very probable that it will shortly become utterly extinct.

MANACOR, a town in the island of Majorca, stands on a slight eminence in a fertile plain, thirty miles east of Palma (forty miles by rail, by way of Inca). The population is 14,894.

MANAGUA, the capital of Nicaragua, Central America, lies on the south shore of Lake Managua. It was mainly owing to the rivalry between Leon and Granada that Managua was chosen as the seat of the national assembly, and apart from the administrative buildings there is little of interest in the place. The population (1900) was about 35,000.

MANAKIN, from the Dutch word *Manneken*, applied to certain small birds, a name apparently introduced into English by Edwards in or about 1743, since which time it has been accepted generally, and is now used for those which form the Family *Pipridæ* of modern ornithologists. The Manakins are peculiar to the Neotropical region, and are said to have many of the habits of the Titmouse Family (*Paridæ*), living, says Swainson, in deep forests, associating in small bands, and keeping continually in motion, but feeding almost wholly on the large soft berries of the different kinds of *Melastoma*.

MANANTADI, or MANANTODDY, a town in Malabar district, Madras, the trading center of the Wainad coffee district. The population, including numerous European coffee planters, with their families, in the neighborhood, was 10,959.

MANASSEH. The tribe of JOSEPH (*q.v.*), the northern and stronger half of the "sons of Rachel," was divided into two branches; so considerable as themselves to bear the name of tribes, which referred their origin to Manasseh and Ephraim, the two sons of Joseph by his Egyptian wife Asenath. Of the two Manasseh was held to be the elder, but the patriarchal story relates how Jacob predicted the superiority of the younger branch, which in fact played far the greater part in history, occupying in the early days of the settlement in Canaan the part of the central mountain land (Mount Ephraim) where the headquarters of armed Israel and the sanctuary of the ark stood (at Shiloh), and in later times holding the kingship, and greatly excelling Manasseh in numerical strength.

MANATEE, an animal belonging to the order *Sirenia*. The name *Manati* was apparently first applied to it by the early Spanish colonists of the West Indies, in allusion to the hand-like use which it frequently makes of its fore limbs; by English writers from the time of Dampier (who gives a good account of its habits) downward it has been generally spelled "Manatee." It was placed by Linnaeus in his heterogeneous genus *Trichechus*, but Storr's name *Manatus* is now generally accepted for it by zoölogists.

The size of the Manatee has been much exaggerated, as there is no trustworthy evidence of its attaining a greater length than eight or perhaps nine feet. The body is somewhat fish-like, but depressed and ending posteriorly in a broad, flat, shovel-like horizontal tail, with rounded edges. The head is of moderate size, oblong, with a blunt, truncated muzzle, and divided from the body by a very slight constriction or neck. The fore limbs are flattened oval paddles, placed rather low on the sides of the body, and showing externally no signs of division into fingers, but with a tolerably free motion at the shoulder, elbow, and wrist joints, and with three diminutive flat nails near their extremities. No traces of hind limbs are discernible either externally

or internally; and there is no dorsal fin. The mouth is very peculiar, the tumid upper lip being cleft in the middle line into two lobes, each of which is separately movable.

Manatees pass the whole of their life in the water, inhabiting bays, lagoons, estuaries, and large rivers, but the open sea, so congenial to the *Cetacea*, is quite unsuited to their peculiar mode of life. As a general rule they prefer shallow water, in which, when not feeding, they lie near the bottom, supporting themselves on the extremity of the tail, or slowly moving about by the assistance of the fore limbs, the tips of which are just allowed to touch the ground, and only raising the top of the head above the surface for the purpose of breathing at intervals of two or three minutes. In deeper water they often float, with the body much arched, the rounded back close to the surface, and the head, limbs, and tail hanging downward. The air in the lungs obviously assists them to maintain their position, acting in the same manner as that in the air-sac of fishes. Their food consists exclusively of aquatic plants, on which they browse beneath the water much as terrestrial ungulates do on the green pastures on shore. They are extremely slow and inactive in their movements, and perfectly harmless and inoffensive, but are subject to a constant persecution from the inhabitants of the countries in which they dwell for the sake of their oil, skin, and flesh.

Manatees, though much less numerous than formerly, are still occasionally found in creeks, lagoons, and estuaries in some of the West India Islands, and at various spots on the Atlantic coast of America from Florida as far south as about 20° S. latitude, and in the great rivers of Brazil, almost as high as their sources. They are also met with in similar situations on the opposite African coast.

MÁNBHÚM, a district in the lieutenant-governorship of Bengal, India, has an area of 4,157 square miles. The headquarters station is at Purulia. The census of 1892 returned the population at 820,511.

MANCHA, LA. This name, when employed in its widest sense, denotes that bare and monotonous elevated plateau of central Spain which stretches between the mountains of Toledo and the western spurs of the hills of Cuenca, being bounded on the south by the Sierra Morena and on the north by the Alcarria, which skirts the upper course of the Tagus. It thus comprises portions of the modern provinces of Toledo, Albacete, and Cuenca, and almost the whole of Ciudad Real. Down to the sixteenth century the eastern portion was known as La Mancha de Montearagon or de Aragon, and the western simply as La Mancha; afterward the northeastern and southwestern sections respectively were distinguished by the epithets "Alta" and "Baja" (upper and lower). La Mancha was created a province in 1691; its officially recognized boundaries have since that time varied considerably, and in common parlance it is often now identified with the modern province of Ciudad Real. Ciudad Real, which is bounded on the north by Toledo and Cuenca, on the east by Albacete, on the south by Jaén and Cordova, and on the west by Badajoz, ranks next to Badajoz and Cáceres in point of extent, containing an area of 7,840 square miles. The population (1898) was 305,002.

MANCHE, a department in the northwest of France, washed by the English Channel (Fr., *La Manche*), from which it derives its name, and made up of the Cotentin, the Avranchin, and part of the Bocage, three districts of the former province of Normandy, is bounded west, north, and northeast by the Channel, east by the department of Calvados, southeast by Orne, south by Mayenne and Ille-et-Vilaine. The capital, St. Lô, is

159 miles west of Paris. The extreme length from northwest to southeast is eighty-one miles, the mean breadth from east to west about twenty-eight miles, and the area 2,289 square miles. The shipping of Manche amounts to some 4,600 vessels, with an aggregate tonnage of 29,000 tons; the exports consist of butter, eggs, poultry, live stock, legumes, meat, fish, horses, grain, stone, brasiery, and hardware. The population in 1901 was 488,361.

MANCHESTER, a city whose industries are famous throughout the civilized world, is situated in the southeastern corner of Lancashire, and forms the center of the towns and villages which constitute the great English cotton district.

The city of Manchester and the borough of Salford are about 180 miles northwest of London. The sister towns stand for the most part on a level plain, the rising ground being chiefly on the north side. The rivers are the Irwell, the Medlock, the Irk, and the Tib, the last entirely overarched and covered by streets and warehouses. The town, as its thousands of brick-built houses show, has been for the most part dug out of its own fields of clay. The parliamentary borough of Manchester has an area of 12,935 acres; the municipal area is 14,294 acres. The parliamentary and municipal boundaries of Salford are identical, and have an area of 5,208 acres.

There are many fine public buildings in Manchester. Among them may briefly be noticed the royal infirmary, consisting of three sides of a quadrangle. The institution will accommodate about 260 patients. The royal exchange is a fine specimen of Italian architecture, and was erected in 1869; the great meeting-hall is one of the largest rooms in England, the ceiling having a clear area, without supporters, of 120 feet in width. The business of the city is conducted in the new town-hall, the most important municipal building in the kingdom. It was completed in 1877, from designs by Waterhouse, who selected as the style of architecture a form of Gothic, but treated it very freely as purposes of utility required. The edifice covers 8,000 square yards, and includes more than 250 rooms. The building consists of continuous lines of corridors surrounding a central courtyard and connected by bridges. The principal tower is 260 feet high, and affords a view which extends over a large part of South Lancashire and Cheshire, and is bounded only by the hills of Derbyshire. It contains a remarkable peal of bells by Taylor of Loughborough, forming an almost perfect chromatic scale of twenty-one bells. The total cost of the building has been £1,053,264, inclusive of £201,925 for interest. The Free Trade hall is a fine structure in the Lombardo-Venetian style, and its great hall will accommodate 5,000 people. The Athenæum was founded by Richard Cobden and others associated with him, for "the advancement and diffusion of knowledge." The institution has become one of the most useful in the town. All the advantages enjoyed by members of high-class social clubs, with the addition of facilities for educational classes and the use of an excellent news-room and a well-selected library of 18,000 volumes, are offered in return for a payment which does not amount to a penny a day. The mechanics' institution contains a library of 17,000 volumes, and has connected with it excellent day and evening schools, and classes for technical instruction. The Portico is a good specimen of the older proprietary libraries and newsrooms.

The opening of the Manchester and Liverpool Railway in 1830 marked an important epoch in the history of modern industry, and since that time Manchester has gradually been connected by rail with every part of the kingdom. The enormous traffic by this means has not,

however, entirely superseded the use of the canals, which formerly played so important a part in the cotton industry. The water supply is under the control of the corporation, which supplies not only the citizens but the surrounding populations. The gathering-ground is a series of reservoirs in the valley of Longerdale, chiefly along the course of the River Etherow. The corporation not only manufactures gas for the lighting of the city, but sells it to out-districts. The chief ecclesiastical building in Manchester is the cathedral, which, however, hardly corresponds to the ideas usually associated with that word. There are about one hundred places of worship in Manchester belonging to the Church of England, but they are not especially remarkable. Of the Roman Catholic churches, the most important are the cathedral church of St. John in Salford, of the earliest decorative character, with a spire 240 feet in height, and the church of the Holy Name, which belongs to the Jesuits, and is remarkable for its costly decoration. Manchester possesses numerous associations for the cultivation of literature and science. There are many educational facilities. The oldest school is the Manchester grammar school, which was founded in 1519 by Hugh Oldham, bishop of Exeter.

The Owens College was founded in 1846 by John Owens, who left nearly \$500,000 to trustees for an institution in which should be taught "such branches of learning and science as were then and might be hereafter usually taught in English universities." The college was opened in 1851.

Manchester is well provided with libraries. The Chetham library is sometimes spoken of as the oldest free library in Europe, and certainly its doors have been open without let or hindrance for more than two centuries, and the building which it occupies is almost the only relic now left of ancient Manchester.

According to the census of 1901, the municipal borough of Manchester contains a population of 543,969 (268,725 males and 275,234 females), while the parliamentary borough has 544,934 (260,214 males, 284,720 females). Salford, on the same authority, has 220,956 (112,610 males, 108,346 females). These figures, however, hardly convey the actual facts of the case. Manchester and Salford are as closely joined as New York and Brooklyn, and are surrounded by populous districts quite as much united. There has been a seeming decrease in the population of the city, which in 1871 was stated to contain 355,655 persons; but this appearance is fallacious, for, while the progress of city improvements has reduced the number of inhabited houses in the center, there has been a large influx into Salford, which has increased by 51,432 persons during the last ten years. The two boroughs, with the urban sanitary districts immediately contiguous, have a population of about 800,000 persons. Manchester, like other towns, grew more rapidly than the provision for its wise government; but determined efforts have been made in the direction of sanitary improvement.

As has already been stated, Manchester is the center of the English cotton industry; but in the town itself of late years the tendency has been more and more in the direction of commerce. Owing to the enhanced value of land, many mills and workshops have been removed to the outskirts and to neighboring villages and towns, so that the center of Manchester and an ever-widening circle around are now chiefly devoted not so much to production as to the various offices of distribution. Large and handsome warehouses and shops abound, and there is every evidence of quick and opulent life. It would be a mistake, however, to regard Manchester as solely dependent upon the industries connected with cotton. There are other important

manufactures which in another community would be described as gigantic. Wool and silk are manufactured on a considerable scale, though the latter industry has for some years been on the decline. The miscellaneous and multifarious articles grouped under the designation of small wares occupy many hands. Machinery and tools, using the term with its most comprehensive meaning so as to include alike philosophical instruments and steam-engines, are made in vast quantities. The chemical industries of the city are also on a large scale. In short, there are but few important manufactures that are wholly unrepresented. The proximity of Manchester to the rich coal-fields of Lancashire has had a marked influence upon its prosperity; but for this, indeed, the rapid expansion of its industries would have been impossible.

It would probably be difficult to find a community in any part of the world with which Manchester has no commercial relations. The enterprise of its merchants has kept pace with the energy of its manufacturers, and the products of its looms are to be found in every land, though doubtless the supremacy which its cotton goods have held in the markets of the world tends to become more and more abated by the gradually increasing foreign competition.

From figures laid before the Manchester Statistical Society, the money extent of trading operations at this center has been calculated at about \$103,500,000 in 1872 and \$1,590,000,000 in 1881. These figures, though to be taken with certain reservations, indicate approximately the extent of the activity of the city.

MANCHESTER, a town of Hartford county, Conn., a station on the New York and New England Railroad, eight miles east of Hartford. Its spinning and weaving mills turn out annually 2,000,000 yards of gingham and 90,000 pairs of stockings; and its paper mills (upward of a dozen in number) produce not only vast quantities of book paper, but government and bank-note paper for several nations. At South Manchester, two and one-half miles distant, and reached by a branch line, are the silk factories of Messrs. Cheney, which cover about eight acres, and give employment to one thousand operatives. The factory village has been laid out by a landscape gardener; and connected with it are a public hall, a library and reading-room, and a free school. The population of the town (1900) was 10,601.

MANCHESTER, one of the county towns of Hillsborough county, N. H., is situated on the left bank of the Merrimac, in a broad plain about ninety feet above the level of the river, sixteen miles from Concord and forty-six northwest of Boston. It is a terminus of several railroads, as well as a principal station on the Boston, Lowell and Concord line. The general plan is regular and spacious; there are several large and ornamental squares, and the main thoroughfare, Elm street, is 100 feet wide, more than a mile long, and bordered by the trees from which it takes its name. Toward the river the frontage consists of great brick-built factories and substantial tenements for the accommodation of the operatives. A city hall (rebuilt after the fire in 1842), the county courthouse, the State reform school (for one hundred and fifty pupils), two opera-houses, and a Roman Catholic convent (St. Ann's) and orphan asylum are among the buildings of note. The city library (24,000 volumes), founded by private enterprise in 1844 as the Manchester Athenæum, became public property in 1854. Water from Lake Massabesic (four miles distant and 2,300 acres in extent) was introduced into the town in 1874, at a cost of nearly \$1,000,000, and is stored in a reservoir capable of containing 16,000,000 gallons. It is almost exclusively to the water-power furnished by the Blodgett Canal (built in

1816 round the Amoskeag Falls, which have a descent of forty-seven feet) that Manchester owes its prosperity as a manufacturing center. The mills possess an aggregate capital of \$7,650,000, work 12,000 looms and 409,000 spindles, and make 143 miles of web daily. Locomotive engines (produced at the rate of fourteen per month), steam fire-engines, edge-tools, circular saws, files, sewing-machines, carriages, leather, boots and shoes, paper, and ale all likewise form important items in the local industry. Manchester is governed by a mayor, a board of aldermen (one member for each of the eight wards), and a common council (three members for each ward). The assessed value of property is \$19,175,408; and the city debt, \$965,550. The population, which was 13,932 in 1850, stands in the succeeding decades at 20,107, 23,536, and 32,630, and was returned in 1900 at 56,987.

MANCHESTER is a post-town of Chesterfield county, Va., situated on the James river, opposite Richmond. It has several flouring-mills and manufactories of cotton, paper, iron, nails, and tobacco. The water power here is of great value, and the town is one of the most flourishing in the State. Population (1900), 9,715.

MANCHURIA is the name by which the territory in the east of Asia occupied by the Manchus is known in Europe. By the Chinese it is called the country of the Manchows, or Manchus, an epithet meaning "Pure," chosen by the founder of the dynasty which now rules over Manchuria and China as an appropriate designation for his family. Manchuria as it has existed for upward of two centuries—that is to say, since it has had an historical existence—is a tract of country wedged in between China and Mongolia on the west and northwest, and Corea and the Russian territory on the Amur on the east and north. Speaking more definitely, it is bounded on the north by the Amur, on the east by the Usuri, on the south by the Gulf of Leaou-tung, the Yellow Sea, and Corea, and on the west by the river Nonni and a line of palisades which stretch from Kwan-chung-tsze to the Great Wall of China. The territory thus defined is about 800 miles in length and 500 miles in width, and contains about 362,310 square miles. It is divided into three provinces, viz., Tsitsihar or Northern Manchuria, Kirin or Central Manchuria, and Leaou-tung or Southern Manchuria. Physically the country is divided into two regions, the one a series of mountain ranges occupying the northern and eastern portions of the kingdom, and the other a plain which stretches southward from Moukden, the capital, to the Gulf of Leaou-tung. Speaking generally, the mountains run in a direction parallel with the lay of the country, and are interspersed with numerous and fertile valleys, more especially on the southern and eastern slopes, where the summer sun brings to rich perfection the fruits of the soil fertilized by the showers of the south monsoon.

Moukden, or as it is called by the Chinese Shing-yang, the capital city of Manchuria, is situated in the province of Leaou-tung. It occupies a fine position on the river Shin, an affluent of the Leaou, and is a city with considerable pretensions to grandeur. The city wall presents a handsome appearance, and is pierced by eight gates. Like Peking, the town possesses a drum tower and a huge bell. The streets are broad and well laid out, and the shops are well supplied with both native and foreign goods. The population is estimated at about 200,000, including that of the suburbs, the richest and most extensive of which are on the western and southern faces of the city. Leaou-yang, which was once the capital of the country, also stands in the province of Leaou-tung, but it is not now a place of much importance. The population of the Chinese dependency of Manchuria is about 7,500,000.

The province of Kirin, or Central Manchuria, is bounded on the north and northwest by the Sungari, on the south by Leaou-tung and Corea, on the west by the line of palisades already spoken of, and on the east by the Usuri and the maritime Russian provinces. It contains an area of about 135,000 square miles, and is entirely mountainous with the exception of a stretch of plain country in its northwestern corner. This plain produces large quantities of indigo and opium. The local trade is considerable, and is benefited by the presence of large junk-building yards, which, owing to the abundance and cheapness of wood, have been established there, and from which the place has derived its Chinese name of Chuen-chang or "shipyard." The town has a well-to-do appearance, and in summer time the houses and shops are gayly decorated with flowers brought from the sunny south. Ashehoh, on the Ashe, with its population of 40,000; Petuna *Sinice* Sing-chung, on the Sungari population 30,000; San-sing, near the junction of the Sungari and Hurka; La-lin, 120 miles to the north of Kirin, population 20,000; and Ninguta, are the other principal cities in the province.

Tsi-tsi-lar, or Northern Manchuria, which contains about 195,000 square miles, is bounded on the north and northeast by the Amur, on the south by the Sungari, and on the west by the Nonni and Mongolia. This province is thinly populated, and is cultivated only along the lines of its rivers. The only towns of any importance are Tsitsihar and Mergen, both situated on the Nonni.

MANDÆANS, also known as Sabians, Nasoræans, or St. John's Christians, an Oriental sect of great antiquity, interesting to the theologian as almost the only surviving examples of a religion compounded of Christian, heathen, and Jewish elements on a type which is essentially that of ancient Gnosticism.

The Mandæans, who can never have been numerous, and are now much decayed, are found in the marshy lands of South Babylonia, the ancient refuge of so many strange sects, particularly in the neighborhood of Basrah (or Bussorah), and in Khûzistân. They speak the languages of the localities in which they are settled (Arabic or Persian), but the language of their sacred books is an Aramaic dialect, which has its closest affinities with that of the Babylonian Talmud, written in a peculiar character suggestive of the old Palmyrene. The existence of the Mandæans has been known since the middle of the seventeenth century.

MANDALAY, the capital of Burmah, is situated about two miles from the left bank of the Irawadi river. It was founded by the king of Burmah, who transferred to it the seat of government from Amarapura in 1860. The city proper is laid out in a square, each side of which is a little over a mile in length. It is inclosed by a crenellated brick wall 26 feet high and 3 feet thick; the twelve gates (three on each side) are surmounted with wooden watch-towers. A deep wet moat, 100 feet broad, with its escarp 60 feet from the walls, extends along all four sides; it is crossed by five bridges. The palace of the king occupies the central space of the city; the walls of its inclosure are laid symmetrically with those of the city, and each face is about 370 yards in length. Population (1901) was 182,498.

MANDAMUS, WRIT OF, in English law, is usually described as a high prerogative writ, containing a command in the name of the king, and issuing from the King's Bench, directed to persons, corporations, and inferior courts, ordering them to do a specific act within the duty of their office.

The writ has passed into the law of the United States. There is in the federal judiciary an employment of the

writ substantially as the old prerogative writ in the King's Bench practice, also as a mode of exercising appellate jurisdiction, also as a proceeding ancillary to a judgment previously rendered, in exercise of original jurisdiction, as when a circuit court having rendered a judgment against a county issues a mandamus requiring its officers to levy a tax to provide for the payment of the judgment. And in the various States mandamus is used under varying regulations, mandate being in some cases substituted as the name of the proceeding.

MANDATE (MANDATUM). The contract of *mandatum* in Roman law was constituted by one person (the *mandatarius*) promising to do something gratuitously at the request of another (the *mandator*), who undertakes to indemnify him against loss. The jurists distinguished the different cases of *mandatum* according as the object of the contract was the benefit of the mandator or a third person singly, or the mandator and a third person, the mandator and the *mandatarius*, or the *mandatarius* and a third person together. The essentials and the terminology of the contract are preserved in most modern systems of law.

MANDEVILLE, BERNARD DE, born in 1670, is generally known as an ethical writer of debasing and degrading tendency, but he was at least as much of a humorist as a philosopher. He was a native of Rotterdam, where his father practiced as a physician for thirty years. A remarkably eloquent school-boy exercise, *De Medicina Oratio Scholastica*, was printed for him at Rotterdam in 1685. He studied for six years at Leyden, and took his degree in medicine in 1691. Immediately afterward he went over to England "to learn the language," which he did to some purpose, writing it with such mastery as to throw doubts upon his foreign extraction. He settled in London as a physician. The *Fable of the Bees* is the general title of the miscellaneous work by which he is known to fame. Died in 1733.

MANDEVILLE, JEHAN DE, the name claimed by the compiler of a singular book of travels, written in French, and published between 1357 and 1371. By aid of translations into many other languages it acquired extraordinary popularity, while a few interpolated words in a particular edition of the English version have gained for Mandeville in modern times the spurious credit of being "the father of English prose."

MANDI, a native state in the Punjab, India, bounded on the north and east by Kullu, on the south by Suket, and on the west by Kangra. The country is mountainous, being intersected by two great parallel ranges, reaching to an average height of from 5,000 to 7,000 feet above the sea. The valleys between the hill ranges are very fertile, and produce all the ordinary grains, besides more valuable crops of rice, maize, sugar-cane, poppy, and tobacco. The area of the state is estimated at about 1,131 square miles, and a census in 1891 gives the population as 166,923.

MANDINGOES, otherwise known as **WANGARAWA**, **MALINKES**, or **WAKORE** (the last probably their primitive designation), are one of the most widely distributed and important peoples of Western Africa to the north of the equator, and perhaps form the best representatives of the Negro stock. The country of Manding, from which their ordinary name is derived, is a comparatively small district on both banks of the Niger. A Mandingo empire, usually called after Mali, the chief town, which stood on the bank of the Niger to the north of Buré, was founded by a certain prince Baramindana or Baramangole in the twelfth century; and its power was gradually extended till, in the reign of Mansa Musa (1311-31), Songhai, Timbuctoo, and, in fact, the whole of the Sudan with the exception of Genné on the Niger, were more or less thoroughly subjugated. Tim-

buctoo finally fell into the hands of the Berbers about 1433; but Mali remained a leading state and its capital a great commercial center till the beginning of the sixteenth century, when Omar Askia, prince of Songhai, captured the city. The Mali dynasty was a Mohammedan one; and, though some sections of the Mandingo race are still pagans, the greater number are ardent supporters of Islam. Of the present grouping and relations of the states in which they are the dominant element, detailed information does not exist.

MANDLA, a district in the chief commissionership of the Central Provinces, India, has an area of 4,719 square miles, and the headquarters are at Mandla town. The district consists of a wild highland region, broken up by the valleys of numerous rivers and streams. In the lower valleys there is abundance of rich black cotton soil, while in the less favored valleys a light friable soil is found. The Nerbudda river flows through the center of the district, receiving several tributaries which take their rise in the Maikal Hills, a range densely clothed with *sál* forest, and forming part of the great watershed between eastern and western India. Tigers and wild beasts abound, and the proportion of deaths caused by wild animals is greater in Mandla than in any other district of the Central Provinces. The census of 1892 disclosed a population of 243,018 (males, 120,473; females, 122,545).

MANDOLIN. See **LUTE**.

MANDRAKE, *Mandragora officinarum*, L., of the potato family, order *Solanaceae*, is a native of Spain, Sicily, Crete, Cilicia, Syria, etc., and North Africa. It has a short stem bearing a tuft of ovate leaves, with a thick fleshy and often forked root. The flowers are solitary, with a purple bell-shaped corolla. The fruit is a fleshy, orange-colored berry. The mandrake has been long known for its poisonous properties and supposed virtues. It acts as an emetic, purgative, and narcotic, and was much esteemed in old times; but, except in Africa and the East, where it is used as a narcotic and antispasmodic, it has fallen into disrepute. In ancient times, according to Isidorus and Serapion, it was used as a narcotic to diminish sensibility under surgical operations. (See **PODOPHYLLIN**.)

MANDRILL, the name of one of the most remarkable, at all events in outward appearance, of the Baboons, *Cynocephalus maimon* or *mormon*. The general characteristics of the genus to which it belongs are given in the article **APE**.

The baboons generally are distinguished from other monkeys by the comparative equality of the length of their limbs, which with the structure of the vertebral column adapts them rather for quadrupedal progression on the ground than for climbing among the branches of trees. They are also remarkable for the great size of their face and jaws as compared with the part of the skull which incloses the brain. The Mandrill, in addition to these characteristics, is distinguished by the heaviness of its body, stoutness and strength of its limbs, and exceeding shortness of its tail, which is a mere stump, not two inches long, and usually carried erect. It is, moreover, remarkable for the prominence of its brow ridges, beneath which the small and closely approximated eyes are deeply sunk; the immense size of the canine teeth; the great development of a pair of oval bony prominences on the maxillary bones in front of the orbits, rising on each side of the median line of the face, and covered by a longitudinally-ribbed naked skin; and more especially for the extraordinarily vivid coloring of some parts of the skin. It would be difficult to imagine a more hideous beast.

MANDURIA, a city of Italy in the province of Lecce, twenty-two miles east of Taranto on the road to

Lecce, in the midst of a wide open country. Population, 8,500.

MANES. This term, which is clearly euphemistic, meaning "goodies" or "good fellows," was applied by the Romans to the spirits of the departed. As in all nations of antiquity, and in many existing savage tribes, these spirits were held by them in great awe and veneration, as being powerful for good or for harm. The doctrine, whether imported from the Egyptian theology or of Turanian origin through the Etruscan tomb-builders, is closely allied to that of the Greek belief in the existence of the souls of heroes, ancestors, and generally of the "mighty dead," whom they call *daimones*, but, of course, in a sense widely different from our notion of *demons*.

MANETHO. Manetho Sebennyta, *Mai en Thoth*, "beloved by Thoth," Egyptian priest and annalist, was a native of Sebennytus (Semmenûd), in the Delta. His name is connected by Plutarch with the reign of Ptolemy I., and he is usually stated to have written under Ptolemy II. Philadelphus, though the only authority for this is an epistle to that king of the Pseudo-Manetho, author of the forged *Book of Sothis* preserved by Syncellus. He was instructed in Greek—so Josephus tells us—and the three books of his *History of Egypt*, composed in that language, opened to foreigners the history of Egypt from the mythical period downward, as it was preserved in the records of the priests. Unhappily the book is now known only by some lists and fragments preserved by Josephus in his treatise *Against Apion* by Eusebius in his *Chronica*, and by Syncellus.

MANFRED, regent and king of the Two Sicilies, a natural son of the emperor Frederick II. by Bianca Lanza, the daughter of a Lombard earl, was born in Sicily about 1231, and received from his father the title of prince of Tarentum in 1248. Frederick II. at his death appointed him regent of the Two Sicilies during the absence of his brother Conrad IV., and he was able, in 1252, to hand over to Conrad an undivided sovereignty. On the death of the latter in 1254, Manfred was once more called to the regency in the interests of his infant nephew Conradin, and by his victory over the forces of Innocent IV. at Foggia, on December 2d of that year, was able to establish his authority over the entire kingdom. Manfred, yielding to the solicitations of his prelates, barons, and people, allowed himself to be crowned at Palermo on August 11, 1258. Excommunicated in 1259 by Alexander IV., Manfred again resorted to arms, and overrunning the papal states, was made master of Tuscany by the battle of Monte Aperto (September 4, 1260). Now at the height of his power, he was anew excommunicated by Urban IV. in 1261, and, in 1263, his forfeited crown was offered to Charles, count of Anjou, and brother of Louis IX. of France. Toward the end of summer in 1265, giving effect to a crusade proclaimed by Urban, Charles, with his army, entered Piedmont, but the encounter with the Sicilians did not take place until February, 1266, at Benevento, where Manfred, filled with despair by the cowardly flight of his Apulians, spurred into the thickest of the battle and fell, covered with wounds.

MANFREDONIA, a seaport and city of Italy, in the province of Foggia, the see of an archbishop and the center of a maritime district, lies twenty-two miles northeast of Foggia, with which it is connected by railway. Population, 9,600.

MANGALIA, a town on the coast of the Black Sea, in the south of the Dobrudja, at the head of a district in the new Roumanian province of Kustendji. In the time of Genoese supremacy in the Black Sea it was a place of 30,000 inhabitants, and its population has again risen from a few hundreds to upward of 2,000.

MANGALORE, the administrative headquarters of south Kánara district, Madras, is situated on the Malabar coast, with a population of 29,667.

MANGANES, a metallic chemical element widely diffused throughout the mineral kingdom, being an almost constant companion of ferrous oxide, lime, and magnesia in their native carbonates and silicates. Of manganese minerals proper, which are comparatively scarce, the most important is *pyrolusite*, the native binoxide. This is a black crystalline or crystallized solid with semi-metallic luster, sufficiently soft to give a (black) streak on paper. It is known in commerce as "black oxide of manganese," or "manganese," and is extensively used for the industrial extraction of chlorine from muriatic acid. Its most extensive beds are found at Ilmenau and Elgersburg, Thuringia; near Giessen, North Hesse; near Mährisch-Trübau, Moravia; and in Spain. For the making of manganese preparations, high-class pyrolusite is the most convenient raw material.

MANGEL WURZEL. See AGRICULTURE.

MANGO. The mango-tree (*Mangifera indica*, L., natural order *Anacardiaceæ* or *Terebinthaceæ*) is a native of tropical Asia, but during the last hundred years has been extensively cultivated in the tropical and subtropical regions of the New as well as the Old World. It grows rapidly to a height of thirty to forty feet, and its dense, spreading, and glossy foliage would secure its cultivation for the sake of its shade and beauty alone. Its fruit, a drupe, though in the wild variety (not to be confused with that of *Spondias mangifera*, Pers., belonging to the same order, also called wild mango in India) stringy and sour from its containing much gallic acid, and with a disagreeable flavor of turpentine, has become sweet and luscious through culture and selection, to which we owe many varieties differing not only in flavor, but also in size, from that of a plum to that of an apple. When unripe they are used to make pickles, tarts, and preserves; ripe, they form a wholesome and very agreeable dessert.

MANGOSTEEN, *Garcinia mangostana*, L., is a tree belonging to the gamboge order (*Clusiaceæ* or *Guttifera*). It is a native of the Molucca Islands, but has been introduced into the other islands of the Eastern archipelago, Ceylon, and southern Asia, and even the Antilles, though not without difficulty. It grows about twenty feet high, and is somewhat fir-like in general form, but the leaves are large, oval, entire, coriaceous, and glistening. Its fruit, the much-valued mangosteen, is about the size and shape of an orange, and is somewhat similarly partitioned, but is of a reddish-brown to chestnut color.

MANGROVE. The remarkable "mangrove forests" which fringe tidal estuaries, overrun salt marshes, and line muddy coasts in the tropics of both Old and New Worlds, are composed of trees and shrubs belonging to the *Rhizophoraceæ*, a small order of calycifloral exogens, mixed, however, with the "white mangrove," *Avicennia*, a verbenaceous plant. Their trunks and branches constantly emit adventitious roots, which, descending in arched fashion, strike at some distance from the parent stem, and send up new trunks, the forest thus spreading like a banyan grove. The roots and stems afford lodgment and shelter to innumerable bivalves, crabs, and other marine animals, while the branches are inhabited by aquatic birds. A further advantage in dispersal, very characteristic of the order, is afforded by the seeds, which have a striking peculiarity of germination. While the fruit is still attached to the parent branch, the long radicle emerges from the seed and descends rapidly toward the mud, where it may ever establish itself before falling off. Owing to

its clubbed shape, this is always in the right position, the plumule then making its appearance. The wood of some species is hard and durable, and the astringent bark is employed in tanning. The fruit of the common mangrove, *Rhizophora Mangle*, L., is sweet and wholesome, and yields a light wine.

MANICHÆISM. At the close of the third century three great religious systems stood opposed to one another in western Asia and the south of Europe; these were Neo-Platonism, Catholicism, and Manichæism. All three may be described as the final results reached, after a history of more than a thousand years, by the religious development of the civilized nations stretching from Persia to Italy. Each had put off the national and particular character of the ancient religions, and had become a world-religion, with universalizing tendencies, and with demands which in their effect transformed the whole of human life, both public and private.

According to the Mohammedan tradition Mani was a high-born Persian of Ecbatana. The year of his birth is uncertain, but Kessler accepts as reliable the statement made by Bīrūnī, that Mani was born in the year 527 of the astronomers of Babylon, (215–216 A.D.)

Mani himself composed a large number of works and epistles, which were in great part still known to the Mohammedan historians, but are now lost. The later heads of the Manichæan churches also wrote religious treatises, so that the ancient Manichæan literature must have been very extensive. According to the *Fihrist*, Mani made use of the Persian and Syriac languages; but, like the Oriental Marcionites before him, he invented an alphabet of his own, which the *Fihrist* has handed down to us. In this alphabet the sacred books of the Manichæans were written even at a late period. The *Fihrist* reckons seven principal works of Mani, six being in the Syriac and one in the Persian language.

The Manichæan system is one of consistent, uncompromising dualism, in the form of a fantastic philosophy of nature. The physical and the ethical are not distinguished, and in this respect the character of the system is thoroughly materialistic; for when Mani coördinates good with light, and evil with darkness, this is no mere figure of speech, but light is actually the only good, and darkness the only evil. From this it follows that religious knowledge can be nothing else than the knowledge of nature and her elements, and that redemption can only consist in a physical process of freeing the element of light from the darkness. Under such circumstances ethics becomes a doctrine of abstinence in regard to all elements which have their source within the sphere of darkness.

The Christian Byzantine and Roman emperors, from Valens onward, enacted strict laws against the Manichæans. But at first these bore little fruit. The auditors were difficult to trace out, and besides they really gave little occasion for persecution. In Rome itself between 370 and 440 Manichæism gained a large amount of support, especially among the scholars and public teachers. It also made its way into the life of the people by means of a popular literature in which the apostles were made to play a prominent part (*Apocryphal Acts of the Apostles*). Manichæism in the West had also some experience of attempts at reformation from the ascetic side, but of these we know little. In Rome Leo the Great was the first who took energetic measures, along with the state authorities, against the system. Valentinian III. decreed banishment against its adherents, Justinian the punishment of death. In North Africa Manichæism appears to have been extinguished by the persecution of the Vandals. But it still continued to exist elsewhere, both in the Byzantine empire and in the West, and in the earlier part of the Middle Ages it gave

an impulse to the formation of new sects, which remained related to it. And, if it has not been quite proved that so early as the fourth century the Priscillianists of Spain were influenced by Manichæism, it is at least undoubted that the Paulicians and Bogomiles as well as the Catharists and the Albigenses are to be traced back to Manichæism (and Marcionitism). Thus the system, not indeed of Mani the Persian, but of Manichæism as modified by Christian influences, accompanied the Catholic Church until the thirteenth century.

MANILA (less correctly **MANILLA**), the capital of Luzon and the Philippine Islands, the late center of Spanish commerce in the East, was founded by Legaspi in 1571, and is situated on the eastern shore of a circular bay 120 nautical miles in circumference. Manila, hemp (*abaca*), sugar, cigars, and coffee are the chief articles of export; and sapan wood, mother of pearl, and gum are regular though secondary items. Population, 350,000.

MANILA HEMP, the most valuable of all fibers for cordage, is the product of the leaf-stalks of *Musa textilis*, a native of the Philippine Islands. The plant, called *abaca* by the islanders, throws up a spurious stem from its rhizome, consisting of a cluster of sheathing leaf-stalks which rise to a height of from twenty to thirty feet, and spread out into a crown of huge undivided leaves characteristic of the various species of *Musa*. In its native regions the plant is rudely cultivated solely as a source of fiber; it requires little attention, and when about three years old develops flowers on a central stem, at which stage it is in the most favorable condition for yielding fiber. Each stalk yields, on an average, a little under one pound of fiber; and two natives cutting down plants and separating fiber will prepare not more than twenty-five pounds per day. The fiber yielded by the outer layer of leaf-stalks is hard, fully developed, and strong, but the produce of the inner stalks is increasingly thin, fine, and weak. The inner fiber is used by the natives, without spinning or twisting (the ends of the single fibers being knotted together), for making exceedingly fine, light, and transparent yet comparatively strong textures, which they use as articles of dress and ornament. The hemp exported for cordage purposes is a somewhat woody fiber, of a bright brownish-white color, and possessing great durability and strain-resisting power. It contains a very considerable amount of adherent pectinous matter, and an unusually large proportion, as much as 12 per cent., of water in a dry condition. In a damp atmosphere the fiber absorbs moisture so freely that it has been found to contain not less than 40 per cent. of water, a circumstance which dealers in the raw fiber should bear in mind. The plant has been introduced into many tropical lands; but the cheapness of labor in its native regions, and its abundance there, prevent its being a profitable substance for general cultivation. The entire supply comes from Manila and Cebu in the Philippine Islands, where its cultivation and preparation give employment to a very large population.

MANILIUS, a Roman poet, was the author of a poem in five books called *Astronomica*. Nothing is recorded of the author; he is neither quoted nor mentioned by any ancient writer. His very name is uncertain, but was probably Marcus Manilius.

MANIN, DANIELE, president of the Venetian republic in 1848–49, and one of the principal founders of Italian independence, was born in Venice on May 13, 1804. He studied at Padua, graduating as doctor of laws when only seventeen years of age, and soon after translated Pothier's large treatise *Sur le Droit Romain*.

In 1847 he spoke ably on political economy at the scientific congress held in Venice, and soon after presented two petitions to the "congregation"—a shadowy

deliberative assembly which was tolerated by Austria. His principal demands were—separate government of Venice and Lombardy, revision of the code, an annual budget, freedom of the press, and religious equality. On January 18, 1848, soon after Radetsky's cruel treatment of Milan, he was arrested, but only to intensify the patriotic enthusiasm of the people. On March 17th Manin was carried in triumph to the Place St. Mark, and virtually declared dictator. Now that the moment for action was come he immediately formed a civic guard, and by his energy and earnestness inspired all classes of the citizens to act as one man. On the 22d the dictator became president of the new republic of St. Mark, to cope alone with all the difficulties of administration, organization, and finance. In March, 1849, on the defeat of King Charles Albert, Venice had to prepare herself resolutely for defense; and on April 2d there was passed in the palace of the Doges a decree in two clauses:—“(1) Venice will resist the Austrians at whatever cost; (2) the president Manin is invested with unlimited powers.” On May 26th one outlying fort was taken, but on July 3d, when Rome and Mazzini had succumbed to the French, Venice and Manin were still strenuous in their heroic defense. Only when cholera had also attacked them, when food and ammunition were spent and people were dying of hunger, when every house not burned down was riddled by the shot and shell of the bombardment, and no gleam of hope from without was visible, was the capitulation signed, August 24, on terms of amnesty to all except the president and thirty-nine other citizens.

Leaving Venice on the 27th, with his wife and two children, Manin spent the rest of his life in Paris, where he maintained a modest independence by teaching his native language. His energies were still devoted to the unification of Italy, so that, whether as a republic or as a kingdom, she might be freed from Austrian domination. He died of heart disease on September 22, 1857, and was buried in the family tomb of Ary Scheffer. In 1868 the remains were removed to Venice, and honored with a public funeral.

MANIOC or MANDIOC. See **CASSAVA** and **ARROW-ROOT**.

MANIPUR, a native state in northeastern India, inhabited by various independent wild hill tribes of Lushais, Kukis, etc. The state consists of an extensive valley, estimated at about 650 square miles in extent, and a large surrounding unsurveyed tract of difficult mountainous country stretching between Assam, Cāchār, Burmah, and Chittagong. The total area is estimated at about 7,600 square miles. The population of the Manipur valley and the surrounding hills is supposed to be about 74,000 hill-men and 65,000 Manipuris.

MANIS. See **PANGOLIN**.

MANISA, or **MANISSA**, a town of Asia Minor or Anatolia, situated on the north side of Mount Sipylus, twenty-eight miles northeast of Smyrna. This town was anciently called *Magnesia ad Sipylum* (see **MAGNESIA**). It is situated on the banks of the Hermus, and is noted as being one of the neatest and cleanest cities in Asia Minor. It is the seat of some considerable trade, and many of the inhabitants are employed in the manufacture of cotton and silk goods and goats' hair shawls. Population, about 40,000.

MANISTEE, the county seat of Manistee county, Mich., is situated 135 miles northwest of Lansing, on the east side of Lake Michigan, at the mouth of the Manistee river, which is navigable for vessels drawing ten to twelve feet of water for the distance of one and one-half miles to Manistee Lake. It is a great seat of the lumber trade, shipping annually 200,000,000 feet of

timber, and having a score of saw-mills and about as many shingle-mills, the latter of which produce in the year 400,000,000 shingles—the largest quantity made at any one place in the world. Planing-mills and foundries are also maintained; and, in consequence of the discovery in 1881 of a bed of solid salt thirty feet thick, extensive salt factories have been built. The surrounding district is especially adapted for fruit-growing; and sportsmen are attracted to the Manistee river and its tributaries by the abundance of the rarely found grayling. The population, 3,373 in 1870, was 7,080 in 1880, and increased to 14,260 in 1900.

MANITOBA, the prairie province of the Dominion of Canada, and formerly known as the Red River Settlement, is situated midway between the Atlantic and the Pacific coasts of the Dominion, about 1,490 miles west of Quebec. It is bounded on the south by the parallel 49° N. latitude, which divides it from the United States; on the west by 101° 20' W. longitude; on the north by 52° 50' N. latitude; and on the east by the western boundary of Ontario, in west longitude 95°. Manitoba formerly belonged to the HUDSON'S BAY COMPANY (*q.v.*), and was, after the transfer of the territory to Canada, admitted in 1870 as the fifth province of the Dominion. At that time the infant province had an area of 14,340 square miles, and some 12,000 people, chiefly half-breeds. In 1881 the limits were increased to the extent indicated above, and now contain, taking the Lake of the Woods as the eastern boundary, nearly 74,000 square miles, or 51,000,000 acres, an area only 8,782 square miles less than that of England and Scotland together, extending 264 miles from north to south, and upward of 300 from east to west. The old district of Assiniboine, the result of the efforts in colonization by the earl of Selkirk, in 1811, and succeeding years, was the nucleus of the province. Manitoba was so called by the Dominion parliament after the lake of that name; the designation is usually considered to be a compound of the Ojibway words, Manitou, great spirit, and Waba, straits between lakes, or a word meaning echo.

The drainage of Manitoba is entirely northeastward to Hudson's Bay. The three lakes—whose greatest lengths are 270, 150, and 130 miles, respectively—are Winnipeg, Winnipegosis, and Manitoba. They are all of a very varying and irregular shape, but average respectively 30, 18, and 10 miles in width. They are fresh, shallow, and tideless. The chief rivers emptying into Lake Winnipeg are the Winnipeg, the Red, and the Saskatchewan. The Assiniboine river, with its source in the province, and navigable from 250 to 350 miles for steamers of light draft, enters the Red river forty-five miles from Lake Winnipeg; and at the confluence of the rivers (“The Forks”) is situated the city of Winnipeg. The Winnipeg, which flows from the territory lying southeast of Lake Winnipeg, is a fine river some 200 miles long, that after leaving Lake of the Woods, dashes with its clear water over many cascades, and traverses very beautiful scenery. At its falls from Lake of the Woods is one of the greatest and most easily utilized water-powers in the world. Like most rivers in the New World, the Red river is at intervals of years subject to freshets. The loose soil on the banks of the river is every year carried away in great masses, and the channel has so widened as to render the recurrence of an overflow unlikely. The Saskatchewan, though not in the province, empties into Lake Winnipeg less than half a degree from the northern boundary. It is a mighty river, rising in the Rocky Mountains, and crossing eighteen degrees of longitude. Near its mouth are the Grand Rapids. Above these, steamers ply to Fort Edmonton, a point upward of 800

miles northwest of the city of Winnipeg. Steamers run from Grand Rapids, through Lake Winnipeg, up Red river to the city of Winnipeg.

The surface of Manitoba is somewhat level and monotonous. It is chiefly a prairie region, with treeless plains of from five to forty miles extent, covered in summer with an exuberant vegetable growth, which dies every year. The river banks are, however, fringed with trees, and in the more undulating lands the timber belts vary from a few hundreds of yards to five or ten miles in width, forming at times forests of no inconsiderable size. The chief trees of the country are the aspen (*Populus tremuloides*) the ash-leaved maple (*Negundo aceroides*), oak (*Quercus alba*), elm (*Ulmus americana*), and many varieties of willow. The strawberry, raspberry, currant, plum, cherry, and grape are indigenous.

The climate of Manitoba, being that of a region of wide extent and of similar conditions, is not subject to frequent variations. Winter, with cold but clear and bracing weather, usually sets in about the middle of November, and ends with March, in April and May the rivers have opened, the snow has disappeared, and the opportunity has been afforded the farmer of sowing his grain. The month of June is often wet, but most favorable for the springing crops; July and August are warm, but excepting two or three days at a time, not uncomfortably so; while the autumn months of August and September are very pleasant. Harvest generally extends from the middle of August to near the end of September. The chief crops of the farmer are wheat (which from its flinty hardness and full kernel is the specialty of the Canadian northwest), oats, barley, and peas. Hay is made of the native prairie grasses, which grow luxuriantly. From the richness and fertility of the soil potatoes and all root crops reach a great size. Heavy dews in summer give the needed moisture after the rains of June have ceased.

The population of the province is very mixed. In 1870 there were 2,000 whites and 10,000 Indian half-breeds. Of the latter, one-half are of English speaking parentage, and chiefly of Orkney origin; the remainder are known as Metis or Bois-brûlés, and are descended from French-Canadian voyageurs. In 1875 a number of Russian Mennonites (descendants of the Anabaptists of the Reformation) came to the country. Some fifty years ago they originally emigrated from Germany to the plains of southern Russia, but came over to Manitoba to escape the conscription. They number nearly 8,000. About 4,000 French Canadians, who had emigrated from Quebec to the United States, have also made the province their home, as well as a number of Icelanders. The remainder of the population is chiefly made up of English-speaking people from the other provinces of the Dominion, from the United States, from England and Scotland, and the north of Ireland. Though somewhat difficult to estimate, the population of Manitoba is estimated in 1901 by Dominion authorities at 254,947.

Like other provinces of the Dominion, Manitoba is under a lieutenant-governor, with a council of five ministers responsible to the local legislature, which again is composed of thirty-eight members. The province is represented by three senators in the Dominion senate, and by five members in the Dominion house of commons. There are three judges of the superior court, and a number of county court judges. The whole province is divided into municipalities, each of which chooses a warden and six councilors annually.

The city of WINNIPEG (*q.v.*), the provincial center of government, law, education, and religion, has 42,340 inhabitants. The trade of the country has chiefly grown up since Winnipeg was connected in 1878 with the

United States railroad system, and it has received a further impulse from the construction of the Canadian Pacific Railway, which traverses the territory. Other chief towns in the province are Brandon, Portage la Prairie, Selkirk, Minnedosa, Emerson, Birtle, and Morris.

MANITOWOC, a city of the United States, the county seat of Manitowoc county, Wis., is situated on the west side of Lake Michigan, at the mouth of Manitowoc river, seventy-seven miles from Milwaukee by the Milwaukee, Lake Shore and Western Railway. It has a good harbor, and is the seat of an active trade in lumber, leather, and wheat. Shipbuilding is also extensively carried on. Population (1900), 11,786.

MANKATO, the county seat of Blue Earth county, Minn., is situated in the midst of a good agricultural district on the right bank of the Minnesota river, and is a station on the Chicago, Milwaukee and St. Paul, the Chicago and North-Western, and the Chicago, St. Paul, Minneapolis and Omaha railways. From St. Paul it is distant eighty-six miles. Population, (1900), 10,599.

MANLEY, MARY DE LA RIVIER, dramatist, political writer, and novelist, the most eminent female "wit" of the reign of Queen Anne, was the daughter of a studious and literary royalist, Sir Roger Manley, governor of the Channel Islands, part author of *The Turkish Spy*, and author of several military histories. Mrs. Manley is herself the chief authority for such particulars of her private life as are known. Toward the close of Anne's reign, finding that Curll had announced *The Adventures of Rivella, or the History of the Author of Atalantis*, and suspecting this to be the work of an enemy, she contrived with dexterous tact to supplant Curll's author, and wrote her own biography under the announced title. She achieved her principal triumph as a writer by her *Secret Memoirs of Several Persons of Quality*, a scandalous chronicle "from the New Atalantis, an island in the Mediterranean," published in 1709. Henceforth she was known as the "author of *Atalantis*." She was born in 1672, and died in 1724.

MANLIUS is the name of a Roman gens, chiefly patrician, but, in later times at least, also containing plebeian families. The Roman historians represent them as intrepid, but stern even to cruelty.

I. MARCUS MANLIUS CAPITOLINUS, a brave and distinguished soldier, was one of the garrison of the Capitol while besieged by the Gauls; when they attempted to scale the rock by night, Manlius, aroused by the crackling of the sacred geese, rushed to the spot and threw down the foremost.

II. TITUS MANLIUS IMPERIOSUS TORQUATUS went to the tribune Pomponius, who had brought his father to trial for overstepping the limits of his office, and threatened to kill him unless he desisted from the accusation (365 B.C.). Shortly after he slew a gigantic Gaul in single combat, and took from him a torques or neck-ornament, whence his surname is said to have been derived.

Both these Manlii belong to a great extent to legend, much of which is probably due to attempts to explain their surnames.

III. TITUS MANLIUS TORQUATUS in his first consulship (235 B.C.) subjugated Sardinia, recently acquired from the Carthaginians; he was consul again (224) during the Gallic war. In 216 he opposed the ransoming of the Romans taken prisoners at Cannæ; and in 215 he went to Sardinia and defeated a Carthaginian attempt to regain possession of the island.

IV. CNÆUS MANLIUS VULSO, consul in 189 B.C., received Asia as his province. Starting from Ephesus in the spring, he marched into Pamphylia, levying enormous contributions. He then attacked the Celts &

Galatia on the pretext that they had aided Antiochus. They took refuge in Mounts Olympus and Magaba, but the missiles of the Roman light troops won each position with great slaughter. In the winter, assisted by ten delegates sent from Rome, he settled the terms of peace with Antiochus. He returned to Rome in 187, and triumphed after much opposition. The discipline of his army was loose, and his soldiers brought into Rome many foreign luxuries.

MANN, HORACE, one of the best known of American educationists, was born at Franklin, Mass., May 4, 1796, and died at Yellow Springs, Ohio, August 2, 1859. He entered the junior classes in Brown University in the year 1816. He graduated in 1819. In 1821 he entered the school of law at Litchfield, Conn., and was called to the bar in 1823. In 1827 he was elected to the State legislature of Massachusetts, and in 1833 he was returned to the upper house. He suggested and organized the State lunatic asylum of Worcester. In 1837 the legislature appointed a board of education to revise and reorganize the common school system of the State; and Mann was appointed secretary.

In 1848 Mann was elected to Congress to fill the vacancy caused by the death of John Quincy Adams. He tried to induce the government to establish a bureau of education at Washington, but this was not done till much later. He resigned his seat in Congress in 1853, and became the first president of Antioch College, at Yellow Springs—a college for the combined education of men and women. Mann's chief work in American education is the reform which he brought about in the common and normal school system of Massachusetts; and this reform is largely due to his twelve annual reports.

MANNA, a concrete saccharine exudation obtained by making incisions in the trunk of the flowering or manna ash tree, *Fraxinus Ornus*, L. At the present day the manna of commerce is collected exclusively in Sicily from cultivated trees, chiefly in the districts around Capaci, Carini, Cinisi, and Favara, small towns twenty to twenty-five miles west of Palermo, and in the townships of Geraci, Castelbuono, and other places in the district of Cefalù, fifty to seventy miles east of Palermo.

The manna of the present day appears to have been unknown before the fifteenth century, although a mountain in Sicily with the Arabic name Gibleman, *i.e.*, "manna mountain," appears to point to its collection there during the period that the island was held by the Saracens, 827-1070.

The manna of Scripture, notwithstanding the miraculous circumstances which distinguished it in the Biblical narrative from anything now known, answers in its description very closely to the tamarisk manna.

MANNHEIM, the most populous town and the second capital of the grand-duchy of Baden, lies on the right bank of the Rhine, in the triangular piece of low-lying ground inclosed between that river and the Neckar. It is the most regularly built town in Germany, consisting of twelve parallel streets intersected at right angles by ten others, which cut it up into about 130 square sections of equal size. These blocks are distinguished, after the American fashion, by letters and numerals. Except on the south side all the streets debouch on the promenade, which forms a circle round the town on the site of the old ramparts. Outside this ring are the suburbs of Schwetzingen Gärten to the south and Neckargärten to the north. Mannheim is connected by a handsome bridge with Ludwigshafen, a rapidly growing commercial and manufacturing town on the left bank of the Rhine, in Bavarian territory. The Neckar is spanned by a suspension bridge. Mannheim contains (1901) 140,384 inhabitants, of whom 14,500 are

Jews, and the rest Roman Catholics and Protestants in nearly equal proportions. Ludwigshafen contains 15,012 inhabitants.

The history of the modern Mannheim begins with the opening of the seventeenth century, when Elector John Frederick IV. founded a town here, which he peopled chiefly with Protestant refugees from Holland. The strongly fortified castle which he erected at the same time had the unfortunate result of making the infant town an object of contention in the Thirty Years' War, during which it was five times taken and retaken. In 1689 Mannheim, which had in the meantime recovered from its former disasters, was captured by the French under Melac, and ruthlessly destroyed. Ten years later it was rebuilt on an extended scale and provided with fortifications. For its subsequent importance it was indebted to Elector Charles Philip, who, owing to ecclesiastical disputes, transferred his residence from Heidelberg to Mannheim in 1720. It remained the capital of the Palatinate for nearly sixty years. In 1794 Mannheim fell into the hands of the French, and in the following year it was retaken by the Austrians after a severe bombardment, which left scarcely a single building uninjured. In 1802 it was assigned to the grand-duke of Baden, who caused the fortifications to be razed. Ludwigshafen, originally only the *tête-du-pont* of Mannheim, received its present name in 1843, and became a town in 1859. Toward the end of last century Mannheim attained great celebrity in the literary world as the place where Schiller's early plays were performed for the first time. It was at Mannheim that Kotzebue was assassinated in 1819.

MANNING, ROBERT, commonly known as Robert of Brunne, a monk of the priory of Brunne, or Bourne, in Lincolnshire, wrote, in the beginning of the reign of Edward III., a metrical history of England from the landing of the imaginary Brute to the end of the reign of Edward I.

MONOMETER, or PRESSURE GAUGE, is an instrument for measuring the hydrostatic pressure exerted by gases, vapors, or liquids against the sides of the closed vessels in which they are confined—as, for instance, the pressure of steam in a steam-boiler.

MANOR, in English law, is an estate in land, to which is incident the right to hold certain courts called courts baron. It might be described as the unit of tenure under the feudal system, and it is historically connected with the territorial divisions of the mark and the parish or township.

MANRESA, a town of Catalonia, Spain, thirty-nine miles northwest of Barcelona, with a population of 15,264.

MANS, LE, a town of France, formerly capital of Maine and now of the department of Sarthe, lies 118 miles (131 by rail) west-southwest from Paris, near the confluence of the Sarthe and the Huisne, on an elevation rising from the left bank of the former river. Three bridges besides that of the railway connect the town with the quarter on the right bank. Of the wide and commodious thoroughfares which are gradually superseding the old winding and narrow streets, the most worthy of notice is the tunnel by which the Place des Jacobins is connected with the river side. The principal building is the cathedral, originally founded by St. Julian, to whom it is dedicated. The population in 1901 was 62,948 (5,282 representing the garrison, etc.). Le Mans is an important railway junction.

MANSEL, HENRY LONGUEVILLE, metaphysician and theologian, was born at Cosgrove, Northamptonshire, England, in 1820, and died in 1871.

MANSFELD, COUNT ERNEST OF, a natural son of Peter Ernest, governor of Luxemburg and Brussels, was

born in 1585. Trained by his godfather, the archduke Ernest of Austria, in the Roman Catholic religion, he devoted himself to the service of the king of Spain in the Netherlands, and to that of the emperor in Hungary. He joined the Reformed Church, and in 1610 formally associated himself with the Protestant princes. From the outbreak of the Thirty Years' War in 1618 he fought steadily on behalf of the elector of the Palatinate both in Bohemia and in the Rhine country. In 1625 he was able to collect a powerful force, with which he intended to attack the hereditary territories of Austria, but, on April 25, 1626, he was defeated by Wallenstein at Dessau. He pressed forward to effect a junction with Bethlen Gabor, prince of Transylvania, but as the latter changed his policy Mansfield had no alternative but to disband his army. When preparing to go to England by Venice, he became ill at a village near Zara, and died on November 20, 1626.

MANSFIELD, a market-town in the county of Nottingham, England, is situated in Sherwood Forest, near the north bank of the river Mann or Maun, seventeen miles northwest from Nottingham, and 140 north-northwest of London by rail. Population (1901), about 18,000.

MANSFIELD, the county seat of Richland county, Ohio, pleasantly situated on high ground, fifty-four miles south of Sandusky, in the midst of a prosperous farming district. It is the terminus of the Northwestern Ohio Railroad, and is at the junction of the Baltimore & Ohio, the Pittsburgh, Fort Wayne & Chicago, and the New York, Pennsylvania & Ohio lines. It possesses a flourishing trade, and extensive manufactories of agricultural implements, machinery, flour, boilers, carriages, and household furniture, with many minor industries. Mansfield has public water-works on the "Holly" system, a public library, and an opera-house. The population, which in 1870 was 8,029, was 17,640 in 1900.

MANSFIELD, WILLIAM MURRAY, EARL OF, was born at Scone, in Perthshire, on March 2, 1705. In 1727 he took chambers in Lincoln's Inn, and in 1730 was called to the bar.

For two or three years he made little or no progress, but at length his appearance in some important Scotch appeal cases brought him into notice, and in Scotland at least he acquired an immense reputation by his appearance for the city of Edinburgh when it was threatened with disfranchisement for the affair of the Porteous mob. His English business had as yet been scanty, but in 1737 a single speech in a jury trial of note may be said to have placed him at the head of the bar, and from this time he enjoyed a great business. In 1738 he married Lady Elizabeth Finch, daughter of the earl of Winchelsea. His political career commenced in 1742 with his appointment as solicitor-general. He had kept entirely aloof during the struggles which preceded the fall of Sir Robert Walpole; he refused any purely political appointment, and only took office as solicitor when he felt assured of the permanence of the new administration. During the next fourteen years Murray was one of the most conspicuous figures in the parliamentary history of the time. In 1754 he became attorney-general, and for the next two years acted as leader of the House of Commons under the administration of the duke of Newcastle. But in 1756, when the government was evidently approaching its fall, an unexpected vacancy occurred in the chief justiceship of the king's bench, and he claimed the office. He was at the same time raised to the peerage as Baron Mansfield. In 1776 he was created earl of Mansfield. In 1783, although he declined to reënter the cabinet, he acted as speaker of the House of Lords during the coalition ministry, and with

this his political career may be said to have closed. He continued to act as chief justice until his resignation in June, 1788, and after five years spent in quiet retirement died peacefully on March 20, 1793.

MANSLAUGHTER. See **MURDER**.

MANSON, GEORGE, a Scottish water-color painter, was born in Edinburgh on December 3, 1850. In 1871 he devoted himself exclusively to painting. His subjects were derived from humble Scottish life—especially child life, varied occasionally by portraiture, by landscape, and by views of picturesque architecture. He died on February 27, 1876.

MANSUR, MANSOOR, or more properly, with the article, **AL-MANSÜR**, "the victorious," a surname assumed by not a few Mohammedan princes.

MANTEGNA, ANDREA, one of the chief heroes in the advance of painting in Italy, was born in 1431, in or near Padua, of very humble parentage. It is said that in his earliest boyhood Andrea was, like Giotto, put to shepherding or cattle-herding; but this can have lasted only a short while, as his natural genius for art developed with singular precocity. Successful and admired though he was in Padua, Mantegna left his native city at an early age, and never afterward resettled there. The rest of his life was passed in Verona, Mantua, and Rome—chiefly Mantua; Venice and Florence have also been named, but without confirmation. Died in 1506.

MANTELL, GIDEON ALGERNON, born in 1790 at Lewes, Sussex, England, rose to eminence as a popular exponent of geology, and contributed many original papers to the literature of the science. He died in 1852.

MANTINEIA was one of the most famous cities of Arcadia. It was situated in the long narrow valley running north and south, which is now called after the chief town, Tripolitza. Tegea was in the same valley, about ten miles south of Mantinea, and the two cities continually disputed the supremacy of the valley. In every great war we find them ranged on opposite sides, except when superior force constrained both. In the Peloponnesus the disputes between Argos and Sparta lasted for centuries, and Mantinea was always an ally of the former.

MANTIS. Probably no other insect has been the subject of so many and widespread legends and superstitions as the common "praying mantis," *Mantis religiosa*, L. The ancient Greeks endowed it with supernatural powers; the Turks and Arabs hold that it prays constantly with its face turned toward Mecca; the Provençals call it *Prega-Diou* (*Prie-Dieu*), and numerous more or less similar names—preacher, saint, nun, mendicant, soothsayer, etc.—are widely diffused throughout southern Europe. Children ask it to show them the way, and Mouffet assures us that it rarely or never deceives them; and it is even recorded that one specimen, which alighted on the hand of St. Francis Xavier, and which he commanded to sing the praise of God, loudly intoned a very beautiful canticle. In Nubia it is held in great esteem, and the Hottentots, if not indeed worshipping the local species (*M. fausta*), as one traveler has alleged, at least appear to regard its alighting upon any person both as a token of saintliness, and an omen of good fortune.

Yet these are "not the saints, but the tigers of the insect world." The front pair of limbs are very peculiarly modified—the coxa being greatly elongated, while the strong third joint or femur bears on its curved underside a channel armed on each edge by strong movable spines. Into this groove the stout tibia is capable of closing like the blade of a penknife, its sharp, serrated edge being adapted to cut and hold. Thus armed, with head raised upon the much-elongated and semi-erect prothorax, and with the half-opened fore-

limbs held outward in the characteristic devotional attitude, its rests motionless upon the four posterior limbs waiting for prey, or occasionally stalks it with slow and silent movements, finally seizing it with its knife-blades and devouring it. Although apparently not daring to attack ants, these insects destroy great numbers of flies, grasshoppers, and caterpillars, and the larger South American species even attack small frogs, lizards, and birds. They are very pugnacious, fencing with their sword-like limbs "like hussars with sabers," the larger frequently devouring the smaller, and the females the males. The Chinese keep them in bamboo cages, and watch them like fighting cocks.

MANTUA, a fortified city of Italy, the chief town of a province, the see of a bishop, and the center of a military district, lies ninety-five miles east-southeast of Milan, and twenty-five miles by rail south of Verona, occupying, at the height of eighty-eight feet above the level of the Adriatic, an almost insular site in the midst of the swampy lagoons of the Mincia, with their vast reaches of reeds and bulrushes. As the belt of marshy ground along the south side can be laid under water at pleasure, the site of the city proper, exclusive of the considerable suburbs of Borgo di Fortezza to the north and Borgo di San Giorgio to the east, may still be said to consist, as it formerly did more distinctly, of two islands separated by a narrow channel and united by a number of bridges. On the west side lies Lago Superiore, on the east side Lago Inferiore—the boundary between the two being marked by the *Argine del Mulino*, a long covered wooden bridge stretching northward from the northwest angles of the city. As approached from the north by the old road, Mantua presents a beautiful prospect with its "towers and walls and waters." The population increased from 26,687 in 1871 to 29,160 in 1901. As a fortress Mantua was long one of the most formidable in Europe, a force of 30,000 to 40,000 men finding accommodations within its walls; but it had two serious defects—the marshy climate told heavily on the health of the garrison, and effective sorties were almost impossible.

Mantua was originally an Etruscan town, and had still a strong Etruscan element in its population during the Roman period. It was a Roman municipium; but Martial calls it Little Mantua, and, had it not been for Virgil's interest in his native place and in the expulsion of a number of the Mantuans from their lands in favor of Octavian's soldiers, we should probably have heard almost nothing of its existence. Besides Virgil, Mantua counts among its celebrities Sordello the Provençal poet, Castiglioni, Folengo the writer of macaronics, and Pomponazzi the philosopher; and it has a long roll of local historians—Donesmondi (ecclesiastical affairs), Possevino, Daino, Amedei, Visi, Tonelli, and Count Carlo d'Arco.

MANUCODE, from the French, an abbreviation of *Manucodiata*, and the Latinized form of the Malay *Manukderwata*, the "bird of the gods," and a name applied for more than 200 years apparently to Birds-of-Paradise in general. In the original sense of its inventor, Montbeillard, *Manucode* was restricted to the King Bird-of-Paradise and three allied species; but in English it has curiously been transferred to a small group of species whose relationship to the *Paradisæida* has been frequently doubted, and must be considered uncertain.

MANUEL I., COMNENUS, emperor of Constantinople from 1143 to 1184, was the fourth son of John II. (Calo-Joannes), and was born about the year 1120. He succeeded to the imperial crown on April 8, 1143, having for his martial qualities been nominated by John to the inheritance in preference to his elder surviving brother. During his reign of thirty-seven years

he was involved in almost perpetual war, in which he displayed much more of the courage of a soldier than of the prudence and skill of a commander. Died in 1185.

MANUEL II., PALÆOLOGUS, emperor of Constantinople, was born in 1348, and succeeded his father, John VI. (with whom he had been associated since 1375), in 1391. At the time he was a hostage at the court of Bajazet at Nicæa, but succeeded in making his escape; he was forthwith besieged in Constantinople by the sultan, whose victory over the Christians at Nicopolis, however (September 28, 1395), did not secure for him the capital. Manuel subsequently set out in person to seek help from the West, and for this purpose visited Italy, France, and Germany, but without material success; the victory of Timur in 1402, and the death of Bajazet in the following year, were the first events to give him a genuine respite from Ottoman oppression. He stood on friendly terms with Mahomet I., but was again besieged in his capital by Amurath II. in 1422. He died in 1425, and was succeeded by his son, John VII.

MANUEL I., emperor of Trebizond, surnamed the Great Captain, was the second son of Alexius I., first emperor of Trebizond, and ruled from 1238 to 1263. Whatever may have been his military skill, or his personal character for bravery, he was unable to deliver his empire from vassalage first to the Seljuks and afterward to the Mongols. He was the founder of the church and monastery of St. Sophia at Trebizond. His predecessor was John I., Axuchus, and his eldest son, Andronicus II., succeeded him.

MANURE. The term "manure," though formerly applied only to the excrements of animals, either alone or mixed with straw, is now more widely used, and is given to all substances, or mixtures of substances, which are added to the soil in order to increase its productivity or to restore the natural fertility lost by repeated cropping.

The atmosphere is the great storehouse of organic plant-food. The carbonic acid always present in the air is, as is well known, eagerly taken up by the leaves of plants, all of which have the power of decomposing carbonic acid, giving off its oxygen and assimilating its carbon. Roughly speaking, three-fourths of the dry substance of all plants is derived from the atmosphere.

Under conditions of natural growth and decay, when no crops are gathered in, or consumed on the land by live stock, the herbage on dying down and decaying returns to the atmosphere and the soil the elements taken from them during life; but under cultivation a succession of crops deprives the land of the constituents which are essential to healthy and luxuriant growth. Without an adequate return to the land of the matters removed in the produce, its fertility cannot be maintained for many years. In newly-opened countries, where old forests have been cleared and the land brought into cultivation, the virgin soil often possesses at first a high degree of fertility, but gradually its productive power decreases from year to year. Generally speaking, it is more convenient to clear fresh forest land than to improve more or less exhausted virgin land by the application of manure, labor, and skill. In all densely peopled countries, where such a mode of cultivation cannot be followed, it is necessary to resort to artificial means to restore the natural fertility of the land and maintain and increase its productiveness.

The researches of Liebig, Wiegmann, Polstorff, and others have proved beyond doubt the important functions of the mineral constituents of the soil in relation to plant life. The gradual removal of phosphate of lime in the tillage of dairy districts, or the removal of

other mineral matters essential to the healthy growth of farm crops, certainly impoverishes the land. The exhaustion of the soil is caused in a much more marked way, however, by the rapid loss in available nitrogenous plant food which soils sustain when under cultivation without manure.

Agricultural improvements manifest themselves in two different directions—the mechanical and the chemical. Under mechanical improvement the physical condition of the soil is bettered and its latent stores of plant food brought into action by mechanical means, such as plowing, subsoiling, steam cultivation, etc. The introduction of new and superior agricultural implements, good systems of drainage, and intelligent division of labor characterize the first stage of progress in agriculture. The second stage is marked by the application of chemical principles to practical agriculture, an application shown by the introduction of a rational system of feeding, a proper rotation of crops, and chiefly the use of chemical or artificial manures for the purpose of restoring the natural fertility of the soil and increasing its productive powers.

The aid which chemistry has rendered during the last twenty-five or thirty years to practical agriculture has greatly promoted agricultural improvements; and farming, which is in large measure dependent for success upon an economical use of manures, is now being carried on much more rationally than in former times. The proper application of various kinds of manures is one of the most prominent features of successful modern farming.

In considering the economical use of manures on the land, regard must be had to the following points:—(1) the requirements of the crops intended to be cultivated; (2) the physical condition of the soil; (3) the composition of the soil; and (4) the composition of the manure. Briefly stated, the guiding principle of manuring economically and profitably is to meet the requirements of the crops intended to be cultivated, by incorporating with the soil, in the most efficacious states of combination, the materials in which it is deficient, or which the various crops usually grown on the farm do not find in the land in a sufficiently available condition to insure an abundant harvest.

Soils vary greatly in composition, and hence it will be readily understood that in one locality or on one particular field a certain manure may be used with great benefit, while in another field the same manure has little or no effect upon the produce. Although increased attention has of recent years been paid to the chemical composition and properties of soils, there is still much room left for improvement, for many farmers disregard altogether the composition of their fields in buying artificial manures.

The principal constituents of manures are—nitrogen, in the form of ammonia, nitrates and nitrogenous organic matters; organic matters not containing nitrogen (humus); phosphoric acid, potash, soda, lime, magnesia, silica, sulphuric acid, and chlorine. Of these constituents by far the most important are the nitrogen, phosphoric acid, and potash.

Farmyard manure is composed of the urine and solid excrements of animals collected in the stalls or yards, together with the straw used as litter. Its composition varies greatly, according to the quantity of straw used as an absorbent, the nature of the animals, the food they have consumed to produce it, the length of time it has been kept, etc.

Analysis shows that farmyard manure contains all the constituents, without exception, which are required by cultivated crops to bring them to perfection, and hence it may be called a perfect manure. Dung, it will be

observed, contains a great variety of organic and inorganic compounds of various degrees of solubility, and this complexity of composition—difficult, if not impossible, to imitate by art—is one of the reasons which render farmyard manure a perfect as well as a universal manure.

The excrements of different kinds of animals vary in composition, and those of the same animal will vary according to the nature and quantity of the food given, the age of the animal, and the way it is generally treated. Thus a young animal which is growing needs food to produce bone and muscle, and voids poorer dung than one which is fully grown and only has to keep up its condition. The solid and liquid excrements differ much in composition, for, while the former contains a good deal of phosphoric acid, lime, magnesia, and silica, and comparatively little nitrogen, the urine is almost destitute of phosphoric acid, and abounds in alkaline salts and nitrogenous organic matters, which on decomposition yield ammonia. Unless, therefore, the two kinds of excrements are mixed, a perfect manure supplying all the needs of the plant is not obtained; care must accordingly be taken to absorb all the urine by the litter. Farmyard manure, it is well known, is much affected by the length of time and the way in which it has been kept. Fresh dung is soluble in water only to a limited extent, and in consequence it acts more slowly on vegetation, and the action lasts longer than when dung is used which has been kept some time; fresh dung is therefore generally used in autumn or winter, and thoroughly rotten dung in spring, when an immediate forcing effect is required.

During the fermentation of dung a large proportion of the non-nitrogenous organic matters disappears in the form of carbonic acid and water, while another portion is converted into humic acids which effectually fix the ammonia gradually produced from the nitrogenous constituents of the solid and liquid excrements. The mineral matters remain behind entirely in the rotten dung, if care be taken to prevent loss by drainage.

Well-fermented dung, as is known to all agriculturists, is more concentrated and consequently more efficacious than fresh farmyard manure. Neither fresh nor rotten dung contains any appreciable quantity of volatile ammonia, and hence there is no necessity for applying gypsum, dilute acid, green vitriol, or other substances recommended as fixers of ammonia. If dung is carted out into the field and spread out at once it may be left for weeks together before it is plowed in without the slightest risk of sustaining loss in fertilizing matter by evaporation, for dung does not lose ammonia by evaporation on exposure to the air, and any mineral soluble salts will be washed into the soil where they are wanted. If, however, dung is kept for a length of time in shallow heaps, or in open straw-yards and exposed to rain, it loses by drainage a considerable proportion of its most valuable soluble fertilizing constituents.

MANUSCRIPTS, ANCIENT. See DIPLOMATICS and PALEOGRAPHY.

MANUTIUS. I. ALDUS MANUTIUS. Teobaldo Mannucci, better known as Aldo Manuzio, the founder of the Aldine press, was born in 1450 at Sermoneta in the Papal States. He received a scholar's training, studying Latin at Rome under Gasparino da Verona, and Greek at Ferrara under Guarino da Verona. Having qualified himself for the career of a humanist, according to the custom of the century, he went in 1482 to reside at Mirandola with his old friend and fellow-student, the illustrious Giovanni Pico. There he stayed two years, prosecuting his studies in Greek literature. Before Pico removed to Florence, he procured for Aldo the post of tutor to his nephews Alberto and Lionello

Pio, princes of Carpi. To Alberto Pio the world owes a debt of gratitude, inasmuch as he supplied Aldo with funds for starting his printing press, and gave him lands at Carpi. It was Aldo's ambition to secure the literature of Greece from further accident by committing its chief masterpieces to type; and the history of his life is the record of the execution of this gigantic task. Aldo selected Venice as the most appropriate station for his labors. He settled there in 1490, and soon afterward gave to the world editions of the *Hero and Leander* of Musæus, the *Galeomymachia*, and the Greek Psalter. These have no date; but they are the earliest tracts issued from his press, and are called by him "Precursors of the Greek Library."

At Venice Aldo gathered an army of Greek scholars and compositors around him. His trade was carried on by Greeks, and Greek was the language of his household. Instructions to type-setters and binders were given in Greek. The prefaces to his editions were written in Greek. Greeks from Crete collated MSS., read proofs, and gave models of calligraphy for casts of Greek type. Not counting the craftsmen employed in merely manual labor, Aldo entertained as many as thirty of these Greek assistants in his family. His own industry and energy were unrelenting. In 1495 he issued the first volume of his Aristotle. Four more volumes completed the work in 1497-98. Nine comedies of Aristophanes appeared in 1498. Thucydides, Sophocles, and Herodotus followed in 1502; Xenophon's *Hellenics* and Euripides in 1503; Demosthenes in 1504. The troubles of Italy, which pressed heavily on Venice at this epoch, suspended Aldo's labors for awhile. But in 1508 he resumed his series with an edition of the minor Greek orators; and in 1509 appeared the lesser works of Plutarch, and in 1513 Plato.

These complete the list of Aldo's prime services to Greek literature. But it may be well in this place to observe that his successors continued his work by giving Pausanias, Strabo, Æschylus, Galen, Hippocrates, and Longinus to the world in first editions. Omission has been made of Aldo's reprints, in order that the attention of the reader might be concentrated on his labors in editing Greek classics from MSS. Other presses were at work in Italy; and, the classics issued from Florence, Rome, or Milan, Aldo took them up, bestowing, in each case, fresh industry upon the collation of codices and the correction of texts. Nor was the Aldine press idle in regard to Latin and Italian classics. For these Italian and Latin editions Aldo had the elegant type struck which bears his name. It is said to have been copied from Petrarch's handwriting, and was cast under the direction of Francesco da Bologna, who has been identified by Panizzi with Francia the painter.

Aldo's enthusiasm for Greek literature was not confined to the printing-room. He burned with a humanist's enthusiasm for books he printed, and we may well pause astonished at his industry, when we remember what a task it was in that age to prepare texts of authors so numerous and so voluminous from MSS. Whatever the students of this century may think of Aldo's scholarship, they must allow that only vast erudition and thorough familiarity with the Greek language could have enabled him to accomplish what he did. In his own days Aldo's learning won the hearty acknowledgment of ripe scholars. To his fellow workers he was uniformly generous, free from jealousy, and prodigal of praise. His stores of MSS. were as open to the learned as his printed books were liberally given to the public. While aiming at that excellence of typography which renders his editions the treasures of the book-collector, he strove at the same time to make them cheap. We may perhaps roughly estimate the

current price of his pocket series of Greek, Latin, and Italian classics, begun in 1501, at 50 cents per volume of our present money. Aldus Manutius died in 1515.

II. PAULUS MANUTIUS. By his marriage with Maria Torresano, Aldo had three sons, the youngest of whom, Paolo, was born in 1512, and died in 1574. In 1533 Paolo undertook the conduct of his father's business, which had latterly been much neglected. In the interregnum between Aldo's death and Paolo's succession (1514-33) the Asolani continued to issue books, the best of which were Latin classics. But, though their publications count a large number of first editions, and some are works of considerable magnitude, they were not brought out with the scholarly perfection at which Aldo aimed. Paolo determined to restore the glories of the house, and in 1540 he separated from his uncles. The field of Greek literature having been well-nigh exhausted, he devoted himself principally to the Latin classics. He was a passionate Ciceronian, and perhaps his chief contributions to scholarship are the corrected editions of Cicero's letters and orations, his own epistles in a Ciceronian style, and his Latin version of Demosthenes.

III. ALDUS MANUTIUS, JUNIOR. The younger Aldo, born in 1547, the year after his father Paolo's marriage, cradled in scholarship, and suckled as it were with printer's ink, proved what is called an infant prodigy. When he was nine years old, his name was placed upon the title page of the famous *Eleganze della lingua Toscana e Latina*. What his share was in that really excellent selection cannot be ascertained; but it is hardly possible that a boy of nine could have compiled it without assistance. The *Eleganze* was probably a book made for his instruction and in his company by his father. In 1561, at the age of fourteen, he produced a work upon Latin spelling, called *Orthographia Ratio*. During a visit to his father at Rome in the next year, he was able to improve this treatise by the study of inscriptions, and in 1575 he completed his labors in the same field by the publication of an *Epitome Orthographiæ*. Printing, in his case, as in the case of his father, went hand in hand with original authorship. About the year 1576, he was appointed professor of literature to the Cancelleria at Venice. The Aldine press continued through this period to issue books, but none of signal merit; and in 1585 Aldo determined to quit his native city for Bologna, where he occupied the chair of eloquence for a few months. In 1587 he left Bologna for Pisa, and there, in his quality of professor, he made the curious mistake of printing Alberti's comedy *Philodoxius* as a work of the classic Lepidus. Sixtus V. drew him in 1588 from Tuscany to Rome; and at Rome he hoped to make a permanent settlement as lecturer. But his public lessons were ill attended, and he soon fell back upon his old vocation of publisher under the patronage of a new pope, Clement VIII. In the tenth year of his residence at Rome, that is, in 1597, he died, leaving children, but none who cared or had capacity to carry on the Aldine press.

MANZONI, ALESSANDRO FRANCESCO TOMMASO ANTONIO, founder of the romantic school in Italian literature, was born at Milan, March 7, 1785. Manzoni's intellect was slow in maturing, and at the various colleges where his school days were passed he ranked among the dunces. At fifteen, however, he developed a passion for poetry, and wrote two sonnets of considerable merit. On the death of his father in 1805, he joined his mother at Auteuil, and spent two years there, mixing in the literary set of the so-called "ideologues," philosophers of the eighteenth century school, among whom he made many friends, notably Claude Fauriel. There too he imbibed the negative creed of Voltairianism, and only after his marriage, and under

the influence of his wife, did he exchange it for that fervent Catholicism which colored his later life.

Manzoni's marriage in 1808 to Henriette Blondel, daughter of a Genevese banker, proved a most happy one, and he led for many years a retired domestic life, divided between literature and the picturesque husbandry of Lombardy. In 1819 Manzoni published his first tragedy, *Il Conte di Carmagnola*, which, boldly violating all classical conventionalism, excited a lively controversy. It was severely criticised in the *Quarterly Review*, in an article to which Goethe replied in its defense, "one genius," as Count de Gubernatis remarks, "having divined the other." The death of Napoleon in 1821 inspired Manzoni's powerful stanzas *Il Cinque Maggio*, the most popular lyric in the Italian language. In 1822, Manzoni published his second tragedy, *Adelchi*, turning on the overthrow by Charlemagne of the Lombard domination in Italy, and containing many veiled allusions to the existing Austrian rule.

With these works Manzoni's literary career was practically closed. The end of the poet's long life was saddened by domestic sorrows. The loss of his wife in 1833 was followed by that of several of his children, and of his mother, to whom he was fondly attached. In 1837 he married his second wife, Teresa Borri, widow of Count Stampa, whom he also survived, while of nine children born to him in his two marriages, all but two preceded him to the grave. The death of his eldest son, Pier Luigi, on April 28, 1873, was the final blow which hastened his end; he fell ill immediately, and died of cerebral meningitis, May 22d, aged eighty-eight.

MAORIES. See NEW ZEALAND.

MAP. As each man stands in the center of his horizon and the portion of the earth's surface which lies within his range of vision has the appearance of a disk, the whole world was in ancient times conceived as a disk surrounded by the sea. It was consequently not uncommon for a people to imagine—as was the case we know with the Chinese, the Hindus, the Chaldeans, the Jews, the Arabs, and even the ancient Peruvians—that it occupied the middle part of the world. The wider a people's range of vision, the wider was the disk the world represented. A circular surface is thus the simplest form for a *mapa mundi* or map of the world; and it is met with both in antiquity and in the Middle Ages. The extent of the circle of vision depends among uncivilized peoples on their way of life. Wandering tribes have seen more of the world than settled tribes; and hunters, fishers, and seamen make the widest excursions. Among them, consequently, we find the beginnings of map-making; and Eskimo, Indians, and Polynesians, for example, show in this matter astonishing quickness of apprehension, while among the settled Negro tribes, on the other hand, there are no maps. A map drawn by an Eskimo woman enabled Sir Edward Parry to discover Fury and Hecla Straits; McClintock during his endeavors to clear up the fate of the Franklin expedition repeatedly got the Eskimo to draw coast maps of the Arctic lands.

Turning to civilized peoples, it is among the Egyptians that we find the earliest recorded examples of cartographic representation. Apollonius of Rhodes (born 230 B.C.) reports in his *Argonautica* that the Egyptians of Colchis, a colony dating from the time of Ramses II. (?), had preserved as heirlooms certain wooden tablets on which land and sea, roads and highways, were accurately indicated; Eustathius, in his commentary on Dionysius Periegetes, mentions that Sesostris the Egyptian king caused route maps to be prepared; and Strabo also refers to certain old maps in the library of Eratosthenes in which Meroc and the south end of the peninsula of India were placed on the same parallel of latitude.

These statements have been confirmed by the actual discovery of such maps and plans on old Egyptian papyrus rolls. Birch has, for instance, identified a drawing on a papyrus in the Turin Museum as the topographical map of a gold-mining district in Nubia. The ancient Babylonians have also the high distinction of having divided space and time in a way that allowed scientific measurements to be made after the still customary method. It was they who originated the division of the ecliptic into twelve signs and later into 360 degrees; and the division of the circle into 360 degrees with sixty minutes to the degree and sixty seconds to the minute, as well as the corresponding division of the hour, was the outcome of their sexagesimal system of numeration. This method of division was introduced among the Greeks by Hipparchus (150 B.C.), and obtained general currency through the geographer Ptolemy, (150 A.D.) By this means were provided the elements necessary for the astronomical determination of geographical position. Among the Egyptians and Babylonians map-making remained in its infantile stage; its scientific development was received at the hands of the Greeks.

The Romans contributed nothing to the development of the scientific method of the Greeks, and did not apply astronomy to the purposes of cartography.

The scholastic Middle Ages confined themselves to imitation of the Roman *orbis*. Fullness of detail, moreover, was gradually lost, meagerness and crudity appearing in its place. Cartography, in fact, fell back to a second childhood. The doctrine of the sphericity of the earth was placed under the ban of the church, and people went back to the Homeric idea of a disk surrounded by the ocean.

The nautical (loxodromic or compass) maps, which make their first appearance in Italy in the thirteenth century, indicate a gratifying improvement in cartography after a long period of stagnation. These maps were constructed with the aid of the compass, and took the name of compass maps because they are covered with the figure of a compass from which numerous straight lines radiate out in all directions over the sheet. The fact that the magnet turns toward the north is first mentioned in 1187. Flavio Gioja of Amalfi was perhaps the first to make a mariner's compass and to teach seamen the use of that important instrument. The courses of individual ships were first of all inserted as straight lines, calculated according to the distances traversed, from particular ports, as Genoa or Venice, to other ports, and when a good supply of such material had been collected and a series of diagonals drawn in accordance therewith, the most important points on the coast and in the islands were fixed. The lines by which the meridians were cut at the same angle were called loxodromes; they gave a correct indication when they cut the true astronomical meridian, a false one when they cut a magnetic meridian. On the Italian charts the loxodromes were drawn as straight lines. The numerous radii of the compass shown on the maps enabled the seaman to find the direction which he had to take to reach his goal. Hence the title loxodromic maps.

Charts on which the degrees were marked became necessary only when navigation extended to the ocean; they were introduced by the Portuguese, probably at the suggestion of Prince Henry the Navigator. They are "plane charts" with lines of longitude and latitude.

Ptolemy's great work, again, became generally well known in western Europe only after it was translated into Latin by Jacobus Angelus de Scarparia in 1409; and this version was first printed in 1475 at Vicenza without maps. The first edition with maps (to wit, a

map of the world, ten maps of Europe, four of Africa, and twelve of Asia) appeared at Rome in 1478. This edition was followed by a great many others. From this long series, which if prolonged to the beginning of the Thirty Years' War would be further increased by five, it is evident that Ptolemy was the great master of the modern time. At first maps were drawn according to Ptolemy's determinations of geographical position; but, in proportion as the study of mathematics, astronomy, and cosmography excited the interest of men of culture, opportunities were afforded of correcting Ptolemy's astronomical positions, especially in the case of central and northern Europe, where the range of the great cosmographer's knowledge had hardly enabled him to collect original material. The new arts of wood and copper engraving supplied the means for a rapid diffusion of printed maps. The oldest map printed from a wooden block (in the National Library at Paris), dating from 1460, and thus belonging to the earliest period of wood engraving, was produced in Germany, and represents Germany and western Europe. It is considered to be a copy from an old Roman map.

After the foundations of trigonometry had been laid by Purbach, Regiomontanus, and others, attempts of a rather rude kind were made in the beginning of the sixteenth century to execute geographical triangulations and delineations. The towns formed the central points of the system, their direction and position from the post of observation being fixed as precisely as possible, and their distance estimated in miles according to the best available data without being accurately measured. It was considered sufficient to assign in this way the relative position of inhabited places, and the representation of the physical relations was very superficial; the course of rivers, for instance, was not measured, but carried past the towns on their banks in conventional lines.

Gerhard Kramer, usually called Mercator (born of German parents at Rupelmonde, in Flanders, in 1512), has the honorable place of a reformer of cartography. We possess his map of Palestine (1537), a map of Flanders (Louvain, 1540) in nine sheets, phototyped in 1882, a globe (1541), and the first critical map of Europe (1554), by which he laid the foundation of his fame as the first cartographer of his age. The exclusive use of Latin letters for maps in Germany was due to his example. Especially famous is his map of the world dating from 1569. By 1601 Mercator's projection was in use for all sea charts. In 1578 Mercator drew up maps for Ptolemy exactly in accordance with his determinations; and these were followed by maps of Germany, the Low Countries, and France (1585), and of Italy (1590). It was his purpose to produce a complete collection of new maps, to which he gave the name *Atlas*; but he died in 1594, and the publication of this first atlas (1595) was left to his son.

A series of important discoveries in mathematics, physics, and astronomy having provided the means of making much more accurate observations and calculations, there followed as a matter of course a substantial improvement in cartography. Of chief moment were the invention of the telescope (1606), Galileo's discovery of Jupiter's moons (1610), and Cassini's calculation of their periods of rotation, so important for determination of longitude (1666), the first application of trigonometry to geodesy by Snellius (1615), Picard's measurement of a degree between Paris and Amiens (1669 and 1670), the French measurement of a degree between Dunkirk and Perpignan by Cassini and Lahire (1683-1718), Hadley's mirror-sextant (1731; according to Newton's idea, 1699), the improvements made on the lunar tables by Tobias Mayer (1753), and John Harrison's chronometer (1761). In this way there set in a

period of transition in cartography which lasted till somewhere about 1750; the results of new investigations and measurements were gradually turned to account, but, while here and there traditional blunders were corrected and expunged, nothing essentially new was as yet created.

Up to this point the whole art of map-making had been treated as a matter of private speculation. It was France that gave the first example of carrying out the cartographic survey of the country at the cost of the state. Such surveys had a double object, one military, to provide the army with satisfactory maps, and the other administrative, to furnish a cadastre for the land tax. The military interest predominated; consequently the surveys have in almost all countries been carried out by officers of the general staff, and the maps are briefly designated as general staff or ordnance maps. For such a survey the whole country is covered with a network of triangles, and, in order to secure the most trustworthy basis for the representation, numerous points are astronomically fixed. In comparison with those maps of earlier date the maps thus produced are distinguished by correctness of detail. Outside of Europe there are but few countries in which a survey based on exact triangulation has been carried out. The largest areas thus measured are the United States of America and British India, where great activity has been shown; and to these may be added Asiatic Russia, portions of Australia, portions of the Dutch possessions in the East Indies, and Algeria.

MAP, MAPES, or MAPUS, WALTER, an ecclesiastical statesman and renowned wit of the twelfth century, must be ranked among the greatest of English writers, though French was the language that he used, and his personal fame has long been lost in the splendor of his creations. He was the cosmogonist and one of the principal creators of the Round Table legends, which supplied the ideal of chivalrous life to so many succeeding centuries. Most of the facts that are known about his position in the world have been gathered from a gossip anecdotal work of his in Latin, *De Nugis Curialium*.

MAPLE. Maples and the sycamore are species of *Acer*, suborder *Acerineæ*, order *Sapindaceæ*. The genus includes about fifty species, natives of Europe, North America, North Asia, especially the Himalayas and Japan. Maples are for the most part trees with palmately-lobed leaves. The flowers are in corymbs or racemes—the lowermost mostly male, the terminal bisexual. The fruit is a two-winged "samara."

The earliest known maples occur in the Miocene strata of Oeningen, where nineteen species have been discovered—a greater number than occurs in any one district at the present day.

North American Species.—*A. saccharinum*, L., the sugar, rock, or birdseye maple. It sometimes attains to seventy or even one hundred feet, more commonly fifty to sixty feet. It is remarkable for the whiteness of the bark. The wood is white, but acquires a rosy tinge after exposure to light. The grain is fine and close, and when polished has a silky luster. The timber is used instead of oak where the latter is scarce, and is employed for axletrees and spokes, as well as for Windsor chairs, etc. It exhibits two accidental forms in the arrangement of the fibers—an undulated one like those of the curled maple (*A. rubrum*), and one of spots, which gives the name birdseye to the wood of this species. Like the curled maple, it is used for inlaying mahogany. It is much prized for bedsteads, writing-desks, shoe-lasts, etc. The wood forms excellent fuel and charcoal, while the ashes are rich in alkaline principles, furnishing a large proportion of the potash exported from Boston and New York. Sugar is princi-

pally extracted from this species, the sap being boiled and the syrup when reduced to a proper consistence run into molds to form cakes. Trees growing in low and moist situations afford the most sap but least sugar. A cold northwest wind, with frosty nights and sunny days in alternation, tends to incite the flow, which is more abundant during the day than the night. A thawing night is said to promote the flow, and it ceases during a southwest wind and at the approach of a storm; and so sensitive are the trees to aspect and climatic variations that the flow of sap on the south and east side has been noticed to be earlier than on the north and west side of the same tree. The average quantity of sap per tree is from fourteen to twenty-four gallons in a season.

A. rubrum, L., the red-flowering or scarlet maple, is a middle-sized tree. It is the first tree to blossom in spring in North America. The wood, like that of other species, is applicable to many purposes, as for the seats of Windsor chairs, turnery, etc. The grain in very old trees is sometimes undulated, which suggested the name of curled maple, and gives beautiful effects of light and shade on polished surfaces. The most constant use of curled maple is for the stocks of fowling, pieces and rifles, as it affords toughness and strength combined with lightness and elegance. The inner bark is dusky red. On boiling, it yields a purple color which with sulphate of iron affords a black dye. The wood is inferior to that of the preceding species in strength and as fuel. Sugar was made from the sap by the French Canadians, but the production is only half as great as that from the sugar maple.

MAR, EARLDOM OF. Mar, one of the ancient divisions or provinces of Scotland, comprised the larger portion of Aberdeenshire, extending from north of the Don southward to the Mounth. It is remarkable for its association with the oldest historical dignity of Scotland, or perhaps of any country, which has been perpetuated to our own time.

MARABOUT is a corruption of the Arabic *Mardbit*, a Moslem name for a hermit or a devotee. Primarily the word is derived from *ribât*, a fortified frontier station. To such stations pious men betook them to win religious merit in war against the infidel; their leisure was spent in devotion, and the habits of the convent superseded those of the camp. Thus *ribât* came to mean a religious house or hospice. The great sphere of the marabouts is North Africa. They are liberally supported by alms, direct all popular assemblies, and have a decisive voice in intertribal quarrels and all matters of consequence.

MARACAIBO, a city and seaport of Venezuela, the capital of the state of Zulia (formerly Maracaibo), lies about twenty-five miles from the sea on the west bank of Lake Maracaibo. The prosperity of the place is due to the fact that it forms the outlet for the produce of a wide region; and if the bar at the mouth of the lake, preventing the entrance of vessels drawing more than ten or eleven feet, were removed Maracaibo would bid fair to become the chief mercantile center of the north coast of South America. Coffee, not of prime quality, cocoa, and hides are the principal exports at present. The population in 1900 was estimated at 36,000.

MARAGHA, a town of Persia, province Azerbaijan, sixty-eight miles from Tabriz, 232 northwest of Teherán, pleasantly situated in a long narrow valley opening toward Lake Urumiah, which lies ten miles to the northwest. Population about 16,000.

MARANHÃO, or MARANHAM (Latinized as *Maraganum*), in full form SAO LUIZ DE MARANHÃO, the chief town of the province of Maranhão in Brazil, is situated on the west side of an island of the same name twenty-eight miles long and fifteen broad. Though

built on so hilly a surface that carriages cannot be used, it is laid out with regularity, and has straight, wide, and clean-looking streets. The population of the State Maranhão is 430,854, about 30,000 belonging to the city.

MARAT, JEAN PAUL, was the eldest child of Jean Paul Mara of Cagliari and Louise Cabrol of Geneva, and was born at Boudry, in the principality of Neuchâtel, on May 24, 1743. His father was a doctor of some learning, who had abandoned his country and his religion, and had married a Swiss Protestant. It was he that laid the basis of the young Jean Paul's scientific learning, and the son at the same time imbibed the doctrines of Rousseau. On his mother's death in 1759 he set out on his travels, and spent two years at Bordeaux in the study of medicine, whence he moved to Paris, where he made use of his knowledge of his two favorite sciences, optics and electricity, to subdue an obstinate disease of the eyes. After some years in Paris he went to Holland, the retreat of philosophers, where all the works of the Encyclopedists were printed for the French market, and then on to London, where he settled in Church Street, Soho, a fashionable district, and practiced his profession. In 1773, at the age of thirty, he made his first appearance as an author with a *Philosophical Essay on Man, being an Attempt to Investigate the Principles and Laws of the Reciprocal Influence of the Soul on the Body*, of which only two volumes are extant, though at the end of the second volume he speaks of a third. The book shows a wonderful knowledge of English, French, German, Italian, and Spanish philosophers, and directly attacks Helvetius, who had in his *L'Esprit* declared a knowledge of science unnecessary for a philosopher. Marat, as he now began to call himself, declares that physiology alone can solve the problems of the connection between soul and body, and proposes the existence of a nervous fluid as the true solution. In 1774 he published a political work, *The Chains of Slavery*, which appeared without his name, and was intended to influence constituencies to return popular members, and reject the king's friends, with innumerable examples from classical and modern history of the ways in which kings enslaved their peoples. The book was too late to have any influence on the general election, and was got up in a style too costly for a wide circulation, but its author declared later that it procured him an honorary membership of the patriotic societies of Carlisle, Berwick, and Newcastle. He remained devoted to his profession, and in 1775 published in London a little *Essay on Glee*, price 1s. 6d., of which no copy is to be found, and in Amsterdam a French translation of the first two volumes of his *Essay on Man*. In this year, 1775, he visited Edinburgh, and on the recommendation of certain Edinburgh physicians, was, on June 30, made an M.D. of St. Andrew's University. On his return to London he published an *Enquiry into the Nature, Cause, and Cure of a Singular Disease of the Eyes*, with a dedication to the Royal Society. In the same year there appeared the third volume of the French edition of the *Essay on Man*, which reached Ferney, and exasperated Voltaire, by its onslaught on Helvetius, into a sharp attack, that only made the young author more conspicuous. His fame as a clever doctor was now great, and on June 24, 1777, the Comte d'Artois, afterward Charles X. of France, "owing to the report he had heard of the good and moral life, and of the knowledge and experience in the art of medicine, of J. P. Marat," made him by brevet physician to his guards, with 2,000 livres a year and allowances.

Marat was soon in great request as a court doctor among the aristocracy; and even Brissot, in his *Mémoires*, admits his influence in the scientific world of

Paris. The next years were much occupied with scientific work, especially the study of heat, light, and electricity, on which he presented memoirs to the Académie des Sciences, but the Academicians were horrified at his temerity in differing from Newton, and, though acknowledging his industry, would not receive him among them. His experiments greatly interested Benjamin Franklin, who used to visit him; and Goethe always regarded his rejection by the Academy as a glaring instance of scientific despotism. In 1780 he had published at Neuchâtel without his name a *Plan de Législation Criminelle*, founded on the humane principles established by Beccaria. In April, 1786, he resigned his court appointment. The results of his leisure were in 1787 a new translation of Newton's *Optics*, and in 1788 his *Mémoires Académiques, ou Nouvelles Découvertes sur la Lumière*.

His scientific life was now over, his political life was to begin; in the notoriety of that political life his great scientific and philosophical knowledge was to be forgotten, the high position he had given up denied, and he himself to be scoffed at as an ignorant charlatan, who had sold quack medicines about the streets of Paris, and been glad to earn a few sous in the stables of the Comte d'Artois. In 1788 the notables had met, and advised the assembling of the states-general. The elections were the cause of a flood of pamphlets, of which one, *Offrande à la Patrie*, was by Marat, and, though now forgotten, dwelt on much the same points as the famous brochure of the Abbé Siéyès. When the states-general met, Marat's interest was as great as ever, and in June, 1789, he published a supplement to his *Offrande*, followed in July by *La Constitution*, in which he embodies his idea of a constitution for France, and in September by his *Tableau des Vices de la Constitution d'Angleterre*, which he presented to the assembly. Marat, who had lived in England, had seen that England was at this time being ruled by an oligarchy using the forms of liberty, which, while pretending to represent the country, was really being gradually mastered by the royal power. His heart was now all in politics; and, feeling that his energies needed a larger scope than occasional tracts afforded, he decided to start a paper. At first appeared a single number of the *Moniteur patriote*, followed on September 12th by the first number of the *Publiciste parisien*, which on September 16th took the title of *L'Ami du Peuple*, and was to absorb his future life.

The life of Marat now becomes part of the history of the French Revolution. From the beginning to the end he stood alone. He was never attached to any party; the tone of his mind was to suspect whoever was in power; and, therefore, no historian has tried to defend him, and all state the facts about him with a strong coloring.

The suspicious tone of his mind extended to his paper, and he made it play the part of the lion's mouth at Venice; whoever suspected anyone had only to denounce him to the *Ami du Peuple*, and the denounced was never left alone till he was proved innocent or guilty. He began by attacking the most powerful bodies in Paris—the Corps Municipal, with Bailly at their head, and the court of the Châtelet—and after a struggle found them too strong for him, and fled to London (January, 1790). There he wrote his *Denonciation contre Necker*, and in May dared to return to Paris and continue the *Ami du Peuple*. He was embittered by persecution, and continued his vehement attacks against all in power—against Bailly, against La Fayette, and at last, after the day of the Champs du Mars, against the king himself. All this time he was hiding in cellars and sewers, where he was attacked by

a horrible skin disease, tended only by the woman Simone Evrard, who remained true to him. The end of the constituent assembly he heard of with joy, and with bright hopes (soon dashed by the behavior of the legislative) for the future, when, almost despairing, in December, 1791, he fled once more to London, where he wrote his *École du Citoyen*. In April, 1792, summoned again by the Cordeliers, he returned to Paris, and published No. 627 of the *Ami*. The war was now the question, and Marat saw clearly enough that it was not sought for the sake of France, that it was to serve the purposes of the Royalists and the Girondins, who thought of themselves alone. Marat, like Danton, foresaw the massacres of September. After the events of August 10th he took his seat at the commune, and demanded a tribunal to try the Royalists in prison. No tribunal was formed, and the massacres in the prisons were the inevitable result. In the elections to the convention, Marat was elected seventh out of the twenty-four deputies for Paris, and for the first time took his seat in an assembly of the nation. At the declaration of the republic, he closed his *Ami du Peuple*, and commenced a new paper, the *Journal de la République Française*, which was to contain his sentiments as its predecessor had done, and to be always on the watch. In the assembly Marat had no party; he would always suspect and oppose the powerful, but refuse power for himself. After the battle of Valmy, Dumouriez was the greatest man in France; he could almost have restored the monarchy, yet Marat did not fear to go uninvited to the tragedian Talma's, and there accuse Dumouriez in the presence of his friends of want of patriotism. His unpopularity in the assembly was extreme, yet he insisted on speaking on the question of the king's trial, declared it unfair to accuse Louis of anything anterior to his acceptance of the constitution, and, though implacable toward the king, as the one man who must die for the people's good, he would not allow Malesherbes, the king's counsel, to be attacked in his paper, and speaks of him as a "sage et respectable vieillard." The king dead, the months from January to May were spent in an unrelenting struggle between Marat and the Girondins. Marat depised the ruling party because they had suffered nothing for the republic, because they talked too much of their feelings and their antique virtue, because they had for their own purposes plunged the country into war; while the Girondins hated Marat as a representative of that rough red republicanism which would not yield itself to a Roman republic, with themselves for tribunes, orators, and generals. The Girondins conquered at first in the convention, and ordered that Marat should be tried before the Tribunal Revolutionnaire. But their victory ruined them, for Marat was acquitted on April 24th, and returned to the convention with the people at his back. Their fall was a veritable victory for Marat. But it was his last. The skin disease he had contracted in the subterranean haunts was rapidly closing his life; he could only ease his pain by sitting in a warm bath, where he wrote his journal, and accused the Girondins, who were trying to raise France against Paris. Sitting thus on July 13th he heard in the evening a young woman begging to be admitted to see him, saying that she brought news from Caen, where the escaped Girondins were trying to rouse Normandy. He ordered her to be admitted, asked her the names of the deputies then at Caen, and, after writing their names, said, "They shall be soon guillotined," when the young girl, whose name was CHARLOTTE CORDAY (*q.v.*), stabbed him to the heart.

Humanity has united to execrate Marat, as the embodiment of unrelentless cruelty and causeless crime.

He is spoken of as a moral monster and gibbeted with Nero and Caligula, while his slayer is classed with Judith as the rightful avenger of the wrongs of a whole people. But it is certain that Marat was a man of great attainments and of irreproachable honesty. A charitable view of his character is that which imputes his savage slaughter of those whom he declared to be enemies of the Republic, to a mind unhinged.

MARATHON was a plain on the northeast coast of Attica, containing four villages—Marathon, Probalinthos, Tricorythos, and Oinoe, which formed a tetrapolis. It was divided from the plain of Athens by Mount Pentelicus and the hilly district of Diacria, and was, in the early period, an autonomous state. After it became incorporated in the Attic state, it retained something of its original distinctive character. The worship of Apollo had its first home in Attica here, and it was carried hence to Athens when the tetrapolis was made part of the Athenian commonwealth. The district was one of the chief seats of the worship of Hercules, and boasted that it was the first place where he had been worshipped as a god. Hence legend localized here several events in the story of the Heraclidæ, and especially the self-sacrifice of Macaria, daughter of Hercules. The legend of Theseus was also known in the district; here the hero slew the Marathonian bull. The plain derived its name chiefly from the battle in which the Athenians and Plateans under Miltiades defeated the Persians, 490 B.C. The 102 Athenians that were slain were buried on the field of battle, contrary to the usual Attic custom, and a mound, which is still called Soro, was erected over them. Another tumulus covered the bodies of the slain Platæns and slaves, and a special monument was raised to Miltiades.

MARBLE is a term applied to any limestone which is sufficiently close in texture to admit of being polished. Many other ornamental stones—such as serpentine, alabaster, and even granite—are sometimes loosely designated as marbles, but by accurate writers the term is invariably restricted to those crystalline and compact varieties of carbonate of lime which, when polished, are applicable to purposes of decoration. The crystalline structure is typically shown in statuary marble. A fractured surface of this stone displays a multitude of facets, which are rhombohedral cleaving planes of the component grains. On placing a thin section of Carrara marble under the microscope, it is seen that each grain is an imperfect crystal, or crystalloid, of calc-spar, having an irregular boundary, and being itself made up of a number of crystalline plates twined together. As marble appears to be, in many cases, a metamorphic rock, it is probable that pressure and heat have been the principal natural agents concerned in the alteration of compact into crystalline limestones.

Among statuary marbles the first place may be assigned to the famous Pentelic marble, the material in which Phidias, Praxiteles, and other Greek sculptors executed their principal works. The characteristics of this stone are well seen in the Elgin marbles, which were removed from the Parthenon at Athens, and are now in the British Museum. The marble was derived from the quarries of Mount Pentelicus in Attica. The *Venus de' Medici* is a notable example of work in Parian marble. Carrara marble is better known than any of the Greek marbles, inasmuch as it constitutes the stone employed by the best sculptors of the present day. This marble occurs abundantly in the Apuan Alps, an offshoot of the Apennines, and is largely worked in the neighborhood of Carrara, Matsa, and Serravezza. Stone from this district was employed in Rome for architectural purposes in the time of Augustus, but the finer varieties, adapted to the needs of the sculptor, were

not discovered until some time later. It is in Carrara marble that the finest works of Michelangelo and of Canova are executed. The purest varieties of this stone are of snow-white color and of fine saccharoidal texture. Perhaps the most generally useful marbles yielded by the Carboniferous system are the black varieties, which are largely employed for chimney-pieces, vases, and other ornamental objects. The color of most black limestone is due to the presence of bituminous matter, whence the mineralogical name anthraconite.

The brown and yellow colors which stalagmitic marbles usually present are due to the presence of oxide of iron. This coloring matter gives special characteristics to certain stones, such as the *giallo antico*, or antique yellow marble of the Italian antiquaries. Siena marble is a reddish mottled stone obtained from the neighborhood of Siena in Tuscany; and a somewhat similar stone is found in King's County, Ireland. True red marble is by no means common, but it does occur, of bright and uniform color, though in very small quantity, in the Carboniferous limestone of Derbyshire and northeast Staffordshire, England. Fire marble is the name given to a brown shelly limestone containing ammonites and other fossil shells, which present a brilliant display of iridescent colors, like those of precious opal.

America possesses some valuable deposits of marble, which in the eastern States have been extensively worked. The crystalline limestones of western New England furnish an abundance of white and gray marble, while a beautiful material fit for statuary work has been quarried near Rutland in Vermont. A gray bird's-eye marble is obtained from central New York, and the grayish clouded limestones of Thomaston in Maine have been extensively quarried. Of the variegated and colored marbles, perhaps the most beautiful are those from the northern part of Vermont, in the neighborhood of Lake Champlain. A fine brecciated marble is found on the Maryland side of the Potomac, below Point of Rocks. Among the principal localities for black marble may be mentioned Shoreham in Vermont and Glens Falls in New York. In Canada the crystalline limestones of the Laurentian series yield beautiful marbles.

MARBLEHEAD, a town and port of entry in Essex county, Mass., is situated on the coast, seventeen miles by rail northeast of Boston, and four miles southeast of Salem, and communicates by two branch lines with the main line of the Eastern Railway. It is built on a rocky peninsula of about 3,700 acres in extent, which juts out into Massachusetts Bay, and has a deep, roomy, and nearly land-locked harbor. The fisheries in which Marblehead was once largely engaged have declined; but shoemaking has become an important industry, and the town is rising into favor as a summer resort. Many of the houses date from the "colonial" period, and one of the churches was built in 1714, but in the summer of 1877 nearly the whole business part of the town was burnt to the ground. The population was 7,703 in 1880, and is now (1900), 7,582.

Marblehead was incorporated in 1649. Of the original settlers, a considerable number were from the Channel Islands, and their peculiarities of speech continued for a long time to affect the local dialect. As at that period the second town of Massachusetts in wealth and size, Marblehead sent 1,000 men to the War of Independence, and its privateers rendered excellent service; but its trading prosperity never recovered from the effects of the contest. Elbridge Gerry, vice-president of the United States in 1812, was born at Marblehead; and the town is the scene of the grim revenge celebrated, with considerable poetical license, in Whitier's *Shipper Ireson's Ride*.

MARBURG, an ancient university town of Prussia, in the province of Hesse-Nassau and district of Cassel, is very picturesquely situated on the slope of a hill on the right bank of the Lahn, fifty miles to the north of Frankfort-on-the-Main, and about the same distance to the southwest of Cassel. The hill on which the town lies is crowned by the extensive old schloss, a fine Gothic building, the most noteworthy parts of which are the rittersaal, dating from 1277-1320, and the beautiful little chapel. Population (1901), about 14,000.

MARBURG, the second town of the Austrian duchy of Styria, is very picturesquely situated on both banks of the river Drave, in a plain called the Pettauer-Feld, at the base of the well-wooded Bachergebirge. It is the seat of the bishop of Lavant, and of the judicial and administrative authorities of the district, and contains a gymnasium, a "realschule," an episcopal seminary, a normal school, a pomological school, a theater, and three hospitals. Population (1901), about 22,000.

MARCANTONIO, or to give him his full name, **MARCANTONIO RAIMONDI**, is celebrated as the chief Italian master of the art of engraving in the age of the Renaissance. The date of his birth is uncertain.

MARCASITE. Modern mineralogists have restricted this name to those forms of native bisulphide of iron which crystallize in the orthorhombic system, and are sometimes known as "prismatic iron pyrites." By the older mineralogists the word was used with less definite meaning, being applied to all crystallized and radiated pyrites, whether rhombic or cubic.

MARCELLINUS, St., according to the Liberian catalogue, became bishop of Rome on June 30, 296; his predecessor was Caius or Gaius.

MARCELLUS, **MARCUS CLAUDIUS**, Roman warrior, was born about 268 B.C., and served first in Sicily against Hamilcar. In his first consulship (222) he was engaged in the war against the Insubres, and won the *spolia opima* by slaying their chief Viridomarus. In his last consulship (208), while both consuls were reconnoitering near Venusia, they were unexpectedly attacked, and Marcellus was killed.

MARCELLUS, **M. CLAUDIUS**, was curule ædile in 56 B.C. with P. Clodius. In 52 he spoke on behalf of Milo at his trial. In 51 he was consul with Ser. Sulpicius. During his consulship he proposed to remove Cæsar from his army from March, 49. After Pharsalus M. Marcellus retired to Mytilene. He made no attempt to return, till in 46 the senate appealed to Cæsar. Marcellus accepted this favor reluctantly. Pressed by Cicero, he left Mytilene for Italy, but was murdered in May by Magius Cilo in the Piræus.

MARCELLUS, **M. CLAUDIUS**, son of C. Marcellus and Octavia, sister to Octavianus, was born about 43 B.C. Octavianus adopted him and made him pontifex and senator with prætorian rank. In 25 he married Julia, daughter of Octavianus, and was looked on as his future successor. Yet in a dangerous illness Augustus gave his signet to Agrippa. Differences arising, Agrippa was made proconsul of Syria to separate the rivals. In 23 Marcellus, while curule ædile, fell ill and died at Baiæ.

MARCELLUS I., pope, succeeded Marcellinus, after a considerable interval, most probably in May 307; under Maxentius he was banished from Rome in 309 on account of the tumult caused by the severity of the penances he had imposed on Christians who had lapsed under the recent persecution. He died the same year, being succeeded by Eusebius.

MARCELLUS II., Marcellus Cervini, cardinal of Santa Croce, a native of the Mark of Ancona, was elected pope in the room of Julius III. on April 9, 1555, but died on the twenty-first day after his election. His successor was Paul IV.

MARCH, the third month of our modern year, contains thirty-one days. As in the Roman year so in the English ecclesiastical calendar used till 1752 this was the first month, and the legal year commenced on March 25th. The Romans called this month *Martius*, from the god Mars; and it received the name *Hlyd Monath* i.e., loud or stormy month, from the Anglo-Saxons. In France March was also generally reckoned the first month of the year until 1564, when, by an edict of Charles IX., January was decreed to be thenceforth the first month. Scotland followed the example of France in 1599; but in England the change did not take place before 1752.

MARCHE, a former province of central France, was bounded on the north by Berri, on the northeast by Bourbonnais, on the east by Auvergne, on the south by Limousin, and on the west by Angoumois and Poitou, embracing the greater part of the modern department of Creuse, a considerable portion of Haute-Vienne, and fragments of Charente and Indre. It derived its name from the circumstance of its being the "mark" or boundary between Poitou and Berri; it is sometimes referred to as Marche Limousin.

MARCHENA, a town of Spain, in the province of Seville, lies in a sandy valley, not far from the Corbones, a tributary of the Gaudalquivir, about thirty miles east-southeast from Seville. The population is 14,000.

MARCIAN (**MARCIANUS**), emperor of the East from 456 to 457, was born in a private station of life in Illyria or Thrace, about the year 391, and at an early age entered the army, where after a considerable term of obscurity he attracted the attention of Ardashir and subsequently of Aspar, being made military secretary and a captain in the guards. He maintained the peace of his dominions during the troubles which convulsed the Western empire in 455; and in 456 his arms were free to repress disturbances in Lazica which had been fomented by the Armenians and Persians. He died in 457, and was succeeded by Leo I.

MARCION, AND THE **MARCIONITE CHURCHES**. In the period between 130 and 180 A.D., the varied and complicated Christian fellowships in the Roman empire crystallized into close and mutually exclusive societies—churches with fixed constitutions and creeds, schools with distinctive esoteric doctrines, associations for worship with peculiar mysteries, and ascetic sects with special rules of conduct. Of churchly organizations the most important, next to Catholicism, was the Marcionite community. Like the Catholic church, this body professed to comprehend everything belonging to Christianity. It admitted all believers without distinction of age, sex, rank, or culture. It was no mere school for the learned, disclosed no mysteries for the privileged, but sought to lay the foundation of the Christian community on the pure gospel, the authentic institutes of Christ. The pure gospel, however, Marcion found to be everywhere more or less corrupted and mutilated in the Christian circles of his time. His undertaking thus resolved itself into a reformation of Christendom. When he died is not known; but his death can scarcely have been much later than the year 165.

The main outlines of his teaching are as follows: Man is, in spirit, soul, and body, a creature of the just and wrathful God. This God created man from Hyle (matter), and imposed on him a strict law. Since no one could keep this law, the whole human race fell under the curse, temporal and eternal, of the Demiurge. Then a higher God, hitherto unknown, and concealed even from the Demiurge, took pity on the wretched, condemned race of men. He sent his Son (whom Marcion probably regarded as a manifestation of the supreme

God Himself) down to this earth in order to redeem men. Clothed in a visionary body, in the likeness of a man of thirty years old, the Son made His appearance in the fifteenth year of Tiberius, and preached in the synagogue at Capernaum. But none of the Jewish people understood Him. Even the disciples whom He chose did not recognize His true nature, but mistook Him for the Messiah promised by the Demiurge through the prophets, who as warrior and king was to come and set up the Jewish empire. The Demiurge himself did not suspect who the stranger was; nevertheless he became angry with Him, and, although Jesus had punctually fulfilled his law, caused Him to be nailed to the cross. By that act, however, he pronounced his own doom. For the risen Christ appeared before him in His glory, and charged him with having acted contrary to his own law. To make amends for this crime, the Demiurge had now to deliver up to the good God the souls of those who were to be redeemed; they are, as it were, purchased from him by the death of Christ. Christ then proceeded to the underworld to deliver the spirits of the departed. It was not the Old Testament saints, however, but only sinners and malefactors who obeyed His summons. Then, to gain the living, Christ raised up Paul as His apostle. He alone understood the gospel, and recognized the difference between the just God and the good. Accordingly, he opposed the original apostles with their Judaistic doctrines, and founded small congregations of true Christians. But the preaching of the false Jewish Christians gained the upper hand; nay, they even falsified the evangelical oracles and the letters of Paul. Marcion himself was the next raised up by the good God, to proclaim once more the true gospel. This he did by setting aside the spurious gospels, purging the real Gospel (the Gospel of Luke) from supposed Judaizing interpolations, and restoring the true text of the Pauline epistles. He likewise composed a book, called the *Antitheses*, in which he proved the disparity of the two gods, from a comparison of the Old Testament with the evangelical writings.

The golden age of the Marcionite churches falls between the years 150 and 250. During that time they were really dangerous to the great church; for in fact they maintained certain genuine Christian ideas, which the Catholic church had forgotten. From the beginning of the fourth century they began to die out in the West; or rather they fell a prey to Manichæism. In the East also many Marcionites went over to the Manichæans; but there they survived much longer. They can be traced down to the seventh century, and then they seem to vanish. But it was unquestionably from Marcionite impulses that the new sects of the Paulicians and Bogomiles arose; and in so far as the western Katharoi, and the antinomian and anti-clerical sects of the thirteenth century are connected with these, they also may be included in the history of Marcionitism.

MARCO POLO. See POLO.

MARCUS, the successor of Pope Sylvester I., according to the Liberian catalogue, had a pontificate of eight months and twenty days, from January 18 to October 7, 336. Of his character or history nothing is recorded. He was succeeded by Julius I.

MÂRDÎN, a town of Turkish Kurdistan, the seat of a governor dependent on the pasha of Diarbekir, is situated about sixty miles southeast of Diarbekir. Population, 18,000.

MARGARET OF ANJOU, who became the queen of Henry VI. of England, was born at Pont à Mousson in Lorraine, on March 24, 1429. In April, 1445, Margaret crossed the Channel, and was received by Henry on her landing at Portchester. A few days later, April 22d, they were married in Tichfield Abbey, or, as some

other authorities say, at Southwick, and on Sunday, May 30th, Margaret was crowned at Westminster. War broke out with France in 1449, and in the course of a single year the whole of Normandy was lost to the English. Suffolk was impeached by the Commons, and the king was persuaded that the best way to protect him was to order him to quit the country. But he was taken and murdered at sea, and for some time the country was in a state of fearful anarchy. Margaret's position was now one that required great tact and delicacy. The king's marriage was already unpopular, and the fact was soon manifest that his wife possessed far higher abilities and greater power of governing than himself. This, together with the king's occasional attacks of mental imbecility, was really the great source of her misfortunes. Civil war at last broke out, and Somerset fell at St. Albans in 1455. Party feeling was bitterly exasperated, and Margaret, as we learn from a contemporary French historian, actually instigated an attack on Sandwich by the French, out of hatred to the duke of York. At length, in 1460, that nobleman openly challenged the crown as his right, and obtained from parliament, with the consent of Henry himself, a settlement of the succession in his favor. Margaret's friends took up her cause in the north of England, and the duke of York, going to meet them, fell at the battle of Wakefield, December 30, 1460. The earl of March, however, soon came up and entered London, where he was proclaimed king by the name of Edward IV., amid the shouts of the citizens, who had always been devoted to his father. Margaret then thought it advisable to withdraw into the north along with Henry and her son, and Edward and Warwick pursued them into Yorkshire, where the bloody battle of Towton (March 29, 1461,) utterly crushed for the time the hopes of the house of Lancaster. Henry and Margaret fled to Scotland and surrendered Berwick to the Scots as the price of their assistance. Margaret and her son soon after entered England with a body of Scots, who besieged Carlisle, but they were driven back by Lord Montague. Then King Henry accompanied another invasion into the county of Durham, which was equally unsuccessful. Next year (1462) Margaret sailed from Kirkcudbright to seek aid in France, and offered the surrender of Calais to Louis XI. if Louis enabled her husband to regain his kingdom. On the total failure of this expedition the well-known story is told by a French writer of her wandering with her son in a forest where she was attacked by robbers, and appealing successfully to the loyalty of one of them to save the son of his king.

Soon after, in April, 1463, she sailed to Flanders and sought the aid of Philip of Burgundy, but he declined to do more than relieve her poverty. But in 1470, when her old enemy the earl of Warwick, having rebelled against King Edward, sought a refuge in France, Louis XI. induced her, though with great difficulty, to pardon him and concert measures along with him for her husband's restoration to the throne. The negotiation was cemented by an agreement for the marriage of her son, the prince of Wales, to the earl's daughter after the kingdom should be recovered, and so successful was the project that Edward was actually driven into exile, and for a period of six months Henry was again acknowledged as king. But the return of King Edward and the battle of Barnet once more changed the aspect of affairs before Margaret was able to rejoin her husband, and when she at length landed again in England she was defeated and taken prisoner at Tewkesbury. To add to her misery her only son Prince Edward was butchered after the battle. Four years later, in 1475, on peace being made between England and France, she was ransomed by Louis XI.,

and returned to her native country. She died at Dampierre near Saumur, in Anjou, on August 25, 1482.

MARGARET OF AUSTRIA, duchess of Savoy, and regent of the Netherlands from 1507 to 1530, was the daughter of the emperor Maximilian and Mary of Burgundy, and was born at Brussels on January 10, 1480. She died at Mechlin in 1530.

MARGARET OF AUSTRIA, duchess of Parma, and regent of the Netherlands from 1559 to 1567, was a natural daughter of Charles V. by Margaret van Gheest, a Flemish lady, and was born at Brussels in 1522. Before her death, which occurred at Otona in 1586, she had the satisfaction of seeing her son Alexander Farnese appointed to the government which she had occupied some twenty years before.

MARGARET, St., queen of Scotland, born in Hungary about 1040, was a daughter of Edward the Atheling, son of Edmund Ironside. She became the wife of Malcolm Canmore in the spring of 1069. She survived her husband, who died in November, 1093, by only a few days.

MARGARET, known in Scottish history as the "Maid of Norway," was, through her mother, Margaret, who had been married to Eric of Norway, the only grandchild of Alexander III. of Scotland, and was born in Norway in 1283. While she was still an infant, Edward I. of England arranged for her betrothal to his son, but this policy was defeated by her early death, which took place, it was alleged, in Orkney, as she was on her way to Scotland, in 1290.

MARGARET OF VALOIS. See MARGUERITE.

MARGARITA, an island in the Caribbean Sea, about eight miles off the coast of Venezuela, constituting along with the lesser islands Blanquilla and Hermanos the new state of Nueva Esparta. It has an area of 400 square miles. Pompatar is the only harbor, Pueblo del Norte and Pueblo de la Mar being rather open roadsteads. Asuncion, the chief town, contains about 3,000 inhabitants. The population of this island was 16,200 in 1807 (about 8,000 being whites), and that of the state 30,983 in 1803.

MARGARITA, St., virgin and martyr, is celebrated by the Church of Rome on July 20th, but her feast formerly fell on the 13th, and her story is almost identical, even in the proper names, with that of the Greek St. Marina (July 17th).

MARGATE, a municipal borough, market-town, and watering-place of Kent, England, is situated in the Isle of Thanet, four miles west of North Foreland, and by rail ninety miles east of London, with which it has also in summer daily steam communication by water. The population of the municipal borough in 1901 was about 17,500.

MARGHILAN, Baber's MARGHINAN, now the administrative center of the Russian province of FERGANA (*q.v.*), a very old town, with high earthen walls and twelve gates, commanded by the fort of Yar Mazar, lies in a beautiful and extraordinarily fertile district of the same name, irrigated by canals from the Shahimardan river. The heat in summer is excessive. Population, about 40,000, chiefly Usbeg.

MARGUERITE DE VALOIS. The name Marguerite was common in the Valois dynasty, and during the sixteenth century there were three princesses, all of whom figure in the political as well as in the literary history of the time, and who have been not infrequently confounded.

I. MARGUERITE D'ANGOULÊME. This, the most celebrated of the Marguerites, bore no less than four surnames. She was born at Angoulême on April 12, 1492, and was two years older than her brother Francis I. She was betrothed early to Charles, Duke d'Alen-

çon, and married him in 1509. She became a widow in 1525. In 1527 she married Henri d'Albret, titular king of Navarre. Marguerite was one of the chief patronesses of letters that France possessed, and the chief refuge and defender of advocates of the Reformed doctrines. Marguerite died in 1549.

II. The second MARGUERITE (1523-1574), daughter of Francis I., married the duke of Savoy in 1559. She is noteworthy as having given the chief impulse at the court of her brother Henry II. to the first efforts of the Pléiade.

III. The third MARGUERITE, called more particularly Marguerite de Valois, was great-niece of the first and niece of the second, being daughter of Henry II. by Catherine de' Medici. She was born in 1553. Marguerite exhibited during her life, which was not a short one, the strange Valois mixture of licentiousness, pious exercises, and the cultivation of art and letters, and died in 1615. She is the "Reine Margot" of anecdotic history and romance.

MARIA THERESA, archduchess of Austria, queen of Hungary and Bohemia, and empress of Germany, was the daughter of the emperor Charles VI. of Austria, and was born in Vienna on May 13, 1717. By the Pragmatic sanction of 1713, a settlement which was guaranteed by the principal states of Europe, her father had regulated the succession in the imperial family; and in 1724 accordingly, after the death of the archduke Leopold, her only brother, she was publicly declared sole heiress of the Austrian dominions. In 1736 she married Francis Stephen of Lorraine, who in the following year became grand duke of Tuscany; and on October 20, 1740, she came to the throne, her husband (emperor in 1745) being declared co-regent. The events of her reign have been briefly summarized under AUSTRIA and HUNGARY. She died at Vienna on November 29, 1780.

MARIANA, JUAN DE, a celebrated Spanish historian, was born at Talavera de la Reina in 1536, and died in 1624.

MARIAZELL, a village in the duchy of Styria, Austria, with about 1,200 inhabitants, is very picturesquely situated in the valley of the Salza, amid the Styrian Alps. Its entire claim to notice lies in the fact that it is the most frequented sanctuary in Austria, being visited annually by about 100,000 pilgrims. The object of veneration is a miracle-working image of the Virgin, carved in lime-tree wood, and about eighteen inches high. This was presented to the place in 1157.

MARIE ANTOINETTE, JOSEPHIE JEANNE, queen of France, was the fourth daughter of Maria Theresa and the emperor Francis I., and was born on November 2, 1755, on the day of the great earthquake at Lisbon, and in the year in which the hereditary policy of enmity between the houses of France and Austria was changed to an alliance between them. From her earliest years she was destined by her mother to sustain this alliance, and was educated, with a view to a marriage with a French prince, by the Abbé de Vermond, who was to have a great influence on her future life. In 1770 Choiseul negotiated her marriage to the young dauphin, which took place on May 16th with the greatest pomp, but which was overshadowed by a terrible accident in Paris at the fête given in honor of the marriage. The dauphine soon found her position very difficult; she was but fourteen, and was intended by her mother to support the Austrian alliance and Choiseul at the court of France. She had hardly arrived at Paris, when her friend and the friend of the Austrian alliance, Choiseul, was dismissed from the ministry, and she was left alone to steer a difficult course by the advice of the Austrian minister, the Count

de Mercy-Argenteau, whose reports of her daily doings to Maria Theresa have been published. In May, 1774, Louis XV. died, and Marie Antoinette became queen of France. Through the first years of her reign she played a very important political part, but, except, as in the cases of Poland and the Bavarian succession, when her mother pressed her to maintain the alliance, she chiefly exerted her influence with regard to individuals, not to measures or policies. This political rôle of hers, which was more than suspected, made her intensely unpopular to the French people, and this feeling was increased by her social mistakes. Her extravagance in dress and her passion for the card-table had greatly incensed and disgusted her mother; and, when her mother's death removed her only frank and bold adviser, she became more extravagant and more frivolous than ever. Her passion for play, her love of amusement, her intimacy with the Polignacs and their wild and dissipated society, her night visits to masked balls in Paris, and her favors to many officers of her guards and young foreigners at her court were the subject of ribald conversation in every coterie of Paris. The scandal of the diamond necklace, in which the queen was not to blame, spread her name with infamy all over France as if she had been guilty; and among the people her extravagance was regarded as a potent cause of their poverty and want. Such was her unpopularity when the states-general met in May, 1789; she was believed to be debauched and dissipated, when her real faults were that she was frivolous and careless of public opinion, Austrian at heart, though queen of France, and opposed to Necker as she had been to Turgot, and to all the reforms and economies her husband, Bonhomme Louis, was willing to institute. From July 14th onward Marie Antoinette headed the party of reaction and armed opposition to the Revolution, and became unwittingly the means of her husband's unpopularity and downfall; for she always had influence enough to prevent his carrying out the frank, honest policy of reform which he desired, but not enough to make him adopt hers in its stead, and is to blame for his vacillations in decisive moments. Left to himself, Louis might have been a reforming king like Charles III. of Spain.

She inspired the collection of foreign troops round Paris, contrary to the king's desire, and thus brought on the taking of the Bastille. She was present at the banquet at Versailles which caused the march of the women to Versailles and the transference of the royal family to Paris. When there, she still looked forward to undoing all that had been done, and would never frankly recognize her position. When brought into negotiation with Mirabeau, she refused to trust him or deal frankly with him. Had she done so, she might possibly have established a strong constitutional government, but she would not have been the self-willed Marie Antoinette. He advised her to go with the king and royal family to some provincial capital, declare the royal adherence to all the early acts of the assembly, but declare also that its later acts were passed under constraint, and were null and void; but she must not do two things—she must not fly toward the frontier, else she would be suspected of seeking foreign aid, and she must not depend on the army, but the people. She would not act while Mirabeau was alive—she was too independent to act by anyone's advice; but when he was dead she did what he had advised her not to do, fled toward the frontier and to Bouillé's army. The royal family were stopped at Varennes, and brought back to Paris, and from that time were regarded as traitors to France. She had yet two more chances. She might have thrown herself

into the hands of Barnave, Duport, and the constitutional party of the constituent assembly, who were ready to rally round their constitutional king, but she would not trust them or take their advice. When she was at the end of her power, when the Tuileries had been stormed, and she was in prison, and the republic proclaimed, Dumouriez was ready, after his victory of Valmy, to turn his army on Paris, dissolve the Jacobins, and reestablish the old constitution, but she would not trust him. It was her last chance. When once the republic was proclaimed it was evident that Louis must die both to cement its foundations and to remove a dangerous center of reaction; and in January, 1793, Marie Antoinette became a widow, never to the last recognizing that she had sacrificed her husband to her obstinacy and self-will. Harrowing descriptions have been given of her treatment in prison during the few remaining months of her life, but, though she was separated from her children, she had every material comfort, no less a sum than 1,110 livres being spent on her food alone between August and October, at the rate of fifteen livres a day. At last her trial came on—a mock trial indeed, as all those of the time, for her execution was determined before she came before the tribunal. Much has been said of the shameful charges made against her; but shameful as they were, they were based on a confession made by her son, which, though probably forced from him and utterly false, was yet put in evidence. The trial was soon over, and on the same day, October 16, 1793, she was guillotined.

MARIE DE FRANCE is one of the most interesting figures in the literary history of the Middle Ages. She is also one of the most mysterious. Nothing is known of her except from her own statements, which amount to little more than that her name was Marie and her country France, that she dedicated one of her works to an unnamed king, and another to a certain Count William. She is mentioned by Denis Pyramus, who was her contemporary, and who says that she was very popular, but gives no particulars.

MARIENBAD, one of the prettiest and most frequented watering-places on the Continent of Europe, with a station on the Kaiser Franz Josephs Railway, lies in a pleasant valley in the district of Tepl, in the northwest of Bohemia, about eighteen miles south of Carlsbad.

MARIENBURG, the chief town of a circle in the district of Dantzic, Prussia, lies thirty miles to the southeast of Dantzic, in a fertile plain on the right bank of the Nogat, a channel of the Vistula, here spanned by a handsome railway bridge and by a bridge of boats. Population, 10,000.

MARIETTA, the capital of Washington county, Ohio, lies on the right bank of the Ohio, at the mouth of the Muskingum, eighty-five miles southeast of Columbus, and is the eastern terminus of the Marietta and Cincinnati Railroad, and the southern terminus of the Cleveland and Marietta Railroad. The surrounding country being rich in petroleum, iron, and coal, the city has become the seat of no inconsiderable industry in the shape of oil-works, iron foundries, and machine-shops, a rolling-mill, tanneries, and carriage, car, bucket, and chair factories. Population (1900 census), 13,348.

MARIETTE, AUGUSTE FERDINAND FRANÇOIS, was born on February 11, 1821. Educated at the Boulogne municipal college, he distinguished himself in geometry, physics, chemistry, history, Latin, Greek, and English. He also evinced a remarkable talent for art. In 1839, when but eighteen years of age, he went to England in the capacity of professor of French. In 1845 his cousin, Nestor L'Hôte, the friend and fellow-traveler of Champollion, died; and upon Auguste Mariette devolved the

pious task of sorting the multitudinous papers of the deceased savant. The young man henceforth became passionately interested in Egyptology, devoted himself to the study of hieroglyphs and Coptic, and in 1847 published a *Catalogue Analytique* of the Egyptian Gallery of the Boulogne Museum. He had now found his vocation, and in 1849, being appointed to a subordinate position in the Louvre, left Boulogne for Paris. Intrusted shortly after with a Government mission for the purpose of seeking and purchasing Coptic, Syriac, Arabic, and Ethiopic MSS. for the national collection, he started for Egypt in 1850. Soon after his arrival he made his celebrated discovery of the ruins of the Serapeum and the subterranean catacombs of the Apis-bulls, buried for probably some 2,000 years under the sands of the Libyan desert. He remained in Egypt for four years, excavating, discovering, and dispatching archaeological treasures to the Louvre, of which museum he was, on his return, appointed an assistant conservator. In 1858, by permission of his own government, he accepted the position of conservator of Egyptian monuments to the ex-khedive, Ismail-Pasha, and so removed with his family to Cairo. His history thenceforth becomes a chronicle of unwearying exploration and brilliant success. The pyramid-fields of Memphis and Sakkara, and the necropolises of Meydum, Abydos, and Thebes were ransacked for sepulchral treasures; the great temples of Denderah and Edfoo were disinterred, and, with their tens of thousands of inscriptions and bas-reliefs, restored to the light of day; important excavations were carried out at Karnak, Medinet-Habu, and Deir-el-Bahari; Tanis (the Zoan of the Bible) was partially explored in the Delta; and even Gebel Barkal in the far Soudan was made to yield monuments of the Ethiopic kings. The Sphinx was also bared to the rock-level, and the famous granite and alabaster monument mis-called the "Temple of the Sphinx" was discovered. In the meanwhile Mariette, raised successively to the rank of bey and then of pasha, had founded the "École Française d'Égyptologie" and the "Institut Égyptien," and created *ab ovo* the museum at Bulak, the richest and by far the most interesting Egyptian collection in the world. Honors and orders were showered upon him. In 1873 the Academy of Inscriptions decreed to him the great biennial prize of 20,000 francs, and in 1878 he was elected a member of the Institute. He was also an honorary member of most of the learned societies of Europe. Though of herculean strength and indomitable energy, he was not proof against over-work of all kinds, physical, mental, and official. Prostrated in 1877 by a first attack of the insidious malady from which only death released him, he lingered for a few years, working to the last, and died at Cairo, January 19, 1881.

MARIGNOLLI, GIOVANNI DE', a notable traveler to the far East of the fourteenth century, born probably prior to 1290, and sprung from a notable family in Florence, is supposed to have died in 1357.

MARIGOLD. This name has been given to several plants, of which the following are the best known: *Calendula officinalis*, L., the pot-marigold; *Tagetes erecta*, L., the African marigold; *T. patula*, L., the French marigold; and *Chrysanthemum segetum*, the corn marigold. All these belong to the order *Compositae*; but *Caltha palustris*, L., the marsh marigold, a ranunculaceous plant.

The first-mentioned is the familiar garden plant with large orange-colored blossoms, and is a native of the meadows of southern Europe. It is unisexual, the "ray" florets being female, the "disk" florets male. This and the double variety have been in cultivation for at least 300 years, as well as a proliferous form, *C*

prolifera, or the "fruitful marigold" of Gerard, in which small flower-heads proceed from beneath the circumference of the flower.

Chrysanthemum segetum, L., the yellow corn marigold, is indigenous to Great Britain, and is frequent in corn-fields in most parts of England. A decoction of the fresh plant gathered before flowering is acrid, and is said to be useful medicinally. When dried it has been employed as hay. It is also used in Germany for dyeing yellow.

Caltha palustris, L., the marsh marigold, the "winking Mary-buds" of Shakespeare, is a common British plant in marshy meadows and beside water.

MARINES. With all maritime nations, especially if they be insular and capable of taking the offensive in war, there must frequently be cases in which naval operations can be supplemented by the landing of a force. The armament, equipment, and discipline of the armies and navies of such nations were in early days practically alike. But with the introduction of more regular levies and better organization arose the necessity for having on board ships-of-war an armed body organized to meet the altered condition of things. Sailors were but engaged for periods during which ships were commissioned; and their previous history and training did not tend to furnish the material required. Regular armies on shore called for disciplined forces afloat—that is to say, for marines, or sea-soldiers, who should have the steadiness of the troops of the line, be accustomed to the peculiar duties of ship life, and be subordinate to the naval authorities.

America alone employs marines in the same manner as England; they have won, as their British comrades have, the approbation of the naval authorities and, on nineteen occasions, the thanks of Congress. Admiral Farragut's opinion that "the marine guard is one of the great essentials of a man-of-war" is corroborated by that of Admiral Wilkes, who considered that "marines constituted the great difference between a man-of-war and a privateer." Formed in 1775 for the "public defense," they rank as the oldest force in the American service; and since that time they have shared in land and sea operations in all parts of the world. In the famous battles between the *Bonhomme Richard* and *Serapis* in 1777, and in that between the *Chesapeake* and *Shannon*, they displayed brilliant gallantry; and while on the one hand they at Derne in 1803 first planted the American flag on a fortress of the Old World, for which exploit "Tripoli" is inscribed on their colors, they on the other shared in the hard fighting of the Mexican war as well as all the important coast actions of the civil war of 1861-65. A proposal to incorporate them with the army after the struggle met with universal condemnation from the authorities best qualified to judge of their value. At present they number seventy-eight officers and 2,000 men under the command of a commandant, who ranks as brigadier-general, with headquarters at Washington. Their administration, organization, and equipment are, as in England, identical with those of the soldiers of the line. They are enlisted for five years, must be five feet six inches in height, between eighteen and thirty-five years of age, and able to read and write. The complement on board ship varies from thirteen to fifty-one officers and men, depending on the rating of the vessel.

MARINETTE, a Wisconsin town, in Marinette county, lies on Green Bay, at the mouth of the Menominee river. The principal industry of the town is the lumber trade. It is situated near the Michigan line, in the midst of a lumbering region. It has banks, churches, schools, telegraphs, and railroad connection. Popula-

MARINI, or MARINO, GIAMBATTISTA, Italian poet, was born at Naples in 1569, and died in 1625.

MARINUS I. (MARTINUS II.) succeeded John VIII. in the pontificate about the end of December, 882. On three separate occasions he had been employed by the three popes who preceded him as legate to Constantinople, his mission in each case having reference to the controversy excited by Photius. Among his first acts as pope were the restitution of Formosus, cardinal bishop of Porto, and the anathematizing of Photius. He died in May or June, 884, his successor being Adrian III.

MARINUS II. (MARTINUS III.), pope from 942 to 946, was preceded by Stephen IX., and followed by Agapetus II.

MARION, FRANCIS, American general, was born in 1732 at Winyah, near Georgetown, S. C. In 1759-61 he served as lieutenant in expeditions against the Cherokees, and in 1775 he was elected a member of the provincial congress of South Carolina. This voted two regiments of infantry, and Marion was elected captain in the second. He was made lieutenant-colonel after the defense of Fort Moultrie at the entrance of Charleston harbor (June 28, 1776), and was present at the unsuccessful attack on Savannah, September, 1779. In August he joined Gates, but was detached a few days before Gates' defeat at Camden on August 16th; at Nelson's Ferry, on the 20th, he rescued 150 of the prisoners from a strong guard. He soon received a general's commission. Pursued by Tarleton and Wemyss, he was driven to North Carolina, but soon returned. After successful skirmishes against superior forces, he formed a camp at Snow's Island, in the midst of the swamps of the Pedee and the Santee. In March, 1781, he defeated Watson at Black river; but meanwhile Doyle had destroyed Marion's camp. In April Lee and Marion took Fort Watson, and in May Fort Motte. In June Greene detached Sumter with Marion and others to make an incursion into the low country. At Quinby Marion's men fought well against Coates; and in August he made a forced march to Parker's Ferry and rescued Colonel Harden, pressed by a superior force. At Eutaw Springs he commanded the right under Greene. After the British retreat to Charleston, Marion went to an important session of the colonial assembly; on the very day that he returned to his brigade, February 24, 1782, it was surprised and dispersed, Marion arriving too late to recover the day. After the war he occupied himself with farming. He died February 27, 1795.

MARION, an Indiana town, in Grant county, of which it is the capital, lies on the Mississinewa river. It has some manufactures and several machine-shops and foundries, together with banks, schools, churches, and newspapers. It is a railroad and telegraph center. Population (1900), 17,337.

MARION, an Ohio town, the capital of Marion county, lies at the junction of several railroads, from which fact it derives its chief importance. It has extensive manufactures, mostly of agricultural implements, carriages, machinery, etc. The town has banks, schools, and churches. It also has several newspapers. It is a telegraph center, and is steadily growing. Population (1900), 11,862.

MARIONETTES are figures, generally below life-size, suspended by threads or wires and imitating with their limbs and heads the movements of living persons.

The high antiquity of puppets appears from the fact that figures with movable limbs have been discovered in the tombs of Egypt and among the remains of Etruria; they were also common among the Greeks, from whom they were imported to Rome. Plays in which the characters are represented by puppets or by the shadows of

moving figures, worked by concealed performers who deliver the dialogue, are not only popular in India and China at the present day, but during several centuries past maintained an important position among the amusements of the people in most European countries. Goethe and Lessing deemed them worthy of attention; and as late as 1721 Le Sage wrote plays for puppets to perform. Everyone remembers in Don Quixote "the curious puppet show, which represents the play of Melisandra and Don Gayferos, one of the best shows that has been acted time out of mind in this kingdom." Reference to puppet shows is frequent in English literature from Chaucer onward.

MARIOTTE, EDME, a celebrated French physicist, was a native of Burgundy. He lived chiefly near Dijon as prior of St. Marton sous Beaune, and was one of the first members of the Academy of Sciences, which was founded at Paris in 1666. He died at Paris May 12, 1684.

MARITIME LAW. See SEA LAWS.

MARITIME PROVINCE (Russian, *Primorskaya Oblast*), a province of the Russian empire, and part of the general-governorship of Eastern Siberia, is a strip of territory which extends along the Siberian coast of the Pacific from Corea to the Arctic Ocean, and also includes the peninsula of KAMCHATKA (*q.v.*), the island of Saghalien or Sakhalin, and several small islands scattered along the coast. Its western boundary stretches northward from the Korean town of Kinghing by Lake Khangka and along the Usuri, keeping to the eastward of the hilly tracts and prairies of northern Manchuria; it then follows an imaginary line which runs due north from the mouth of the Usuri to the bay of Udskey, separating the province from the lowlands and mountain wildernesses of the Amur province; it next runs along the Stanovoy watershed between the Pacific and the Arctic Ocean, leaving to the west the elevated tracts of the Siberian plateau, and finally it crosses the spurs of this plateau through barren *tundras* belonging to Yakutsk, reaching the Arctic Ocean at the Chauns-kaya Bay. The province has a length of 2,300 miles and a width varying from 40 to 420 miles; it covers an area of 730,000 square miles, and exhibits very great varieties of climate, scenery, and population.

MARIUPOL, a seaport of Russia, on the northern shore of the Sea of Azoff, at the mouth of the Kalmius, in the government of Ekaterinoslav, fifty-five miles west of Taganrog. It is connected by a branch railway with the line between Kharkoff and Taganrog, and is situated on the highway between the latter town and the Crimea. Population, 1898, 31,772.

MARIUS, CAIUS, is one of the most striking figures in Roman history. Born the son of a small farmer at Arpinum (Arpino), the birthplace also of Cicero, in 155 B.C., he worked his way up from this humble origin, in spite of the most determined opposition from the senate and the aristocracy, to the highest position in the state, was seven times consul, and was spoken of as a third Romulus and a second Camillus. He began life as a soldier, and first saw war in Spain under the great Scipio Africanus, whose good opinion he won, and so rose from the ranks to be an officer. Marius achieved some important success over Jugurtha, and had shown that he was the man to settle a tiresome guerrilla war, and when he was a little over fifty, in 107 B.C., he was, amid great popular enthusiasm, elected consul for the first time. In the following year, in conjunction with his future political rival, Sulla, he brought the war to a triumphant issue, and passed two years in his province of Numidia, which he thoroughly subdued and annexed to Rome's dominion.

By this time Marius was generally recognized as the

ablest general of the day, and in face of the great peril now beginning to threaten Rome from the north of the Alps, where an immense multitude of Cimbric and Teutones were hanging on the borders of Italy, public opinion promptly summoned him to the chief command. Two armies had been utterly destroyed in the neighborhood of the Lake of Geneva, and it seemed as if a repetition of the disaster of Allia in 390 B.C., and the capture of Rome itself, might be not impossible. Marius, out of unpromising materials and a demoralized soldiery, organized a well-disciplined army, with which he inflicted on the invading hordes two decisive defeats, the first in 102 B.C. at Aquæ Sextiæ (Aix in the department of Bouches du Rhône, some way north of Marseilles), and the second in the following year at Vercellæ (Vercelli, about midway between Turin and Milan), the result being that for a period of some centuries Rome had nothing to fear from the northern barbarians. Deservedly indeed was Marius elected consul a fifth time, hailed as the "savior of his country," and honored with a triumph of unprecedented splendor.

The really glorious part of his career was now over, and the remainder of his life is associated with the worst cruelties and horrors of civil war, revolution, and prescription. The hideous strifes of Marius and Sulla have passed into a proverb. Marius was appointed in 88 B.C., after a riot and partial revolution, to the command in the war in the East with Mithridates, but the triumph of Sulla and the aristocratical party almost immediately afterward drove him as an outlaw from Rome, and he had to seek safety amid the marshes round Minturnæ (Garigliano) in Latium. The Gallic trooper sent by the local authorities to strike off the old man's head quailed, it is said, before the fire of his eye, and fled. Meantime, in the absence of Sulla, who had left Italy for the Mithridatic war, Cinna's sudden and violent revolution had put the senate at the mercy of the popular leaders, and Marius greedily caught at the opportunity of a bloody vengeance, which became in fact a reign of terror in which senators and nobles were slaughtered wholesale. He had himself elected consul, for the seventh time, in fulfillment of a prophecy given to him in early manhood. Thus, full of honors in one sense, but really hated and execrated, he closed his career, dying in the delirium of fever in 86 B.C., aged seventy.

MARIVAUX, PIERRE CARLET DE CHAMBLAIN DE, novelist and dramatist, was born at Paris in 1688, and died in 1763.

MARK, the traditional name of the author of the Second Gospel. The name Mark occurs in several books of the New Testament. In the Acts of the Apostles, chap. xii., mention is made of "John whose surname is Mark," to the house of whose mother, Mary, at Jerusalem, Peter went when miraculously released from prison. This John Mark went with Barnabas and Paul on their missionary journey, as far as Perga in Pamphylia, and then, "departing from them, returned to Jerusalem." On the subsequent history of Mark the Acts of the Apostles are silent.

MARK, GOSPEL OF. See GOSPELS.

MARKIRCH, a flourishing industrial town of Germany, in Upper Alsace, circle of Rappoltswiler, is prettily situated in the valley of the Leber or Liepvetre, an affluent of the Rhine, near the French frontier. The population in 1901 was about 13,000.

MARLBOROUGH, a municipal and parliamentary borough of Wiltshire, England, situated on the great highroad between London and Bath, and distant seventy-five miles from the former, thirty-two from the latter, and thirteen from Devizes. Population, 5,600.

MARLBOROUGH, a town of Middlesex county, Mass., about twenty-five miles west from Boston, with

stations on the Old Colony and the Fitchburg railways. It lies in a fertile hilly district, and contains a beautiful sheet of water 160 acres in extent, known as Williams Lake. Shoemaking is the staple industry, some of the factories in the department rivaling the largest in the world. There is a good public library; and three weekly newspapers are published in the town. The population increased from 8,474 in 1870 to 13,609 in 1900.

MARLBOROUGH, JOHN CHURCHILL, DUKE OF. John Churchill, the first duke of Marlborough, was born June 24, 1650. Arabella Churchill, his eldest sister, and the mother of the duke of Berwick, was born in the same house on February 28, 1648. When fifteen years old he obtained a place in the household of the duke of York, and about the same time his sister Arabella became maid of honor to the duchess and mistress of the duke (afterward James II.), two events which contributed greatly to the advancement of the Churchills. Next year, in 1666, he received, through the influence of his master, a commission in the guards, and left England for service at Tangiers. Such fighting as was waged with the Moors did not accord with his feelings, and he soon returned to his own country. For a few years afterward Churchill remained in attendance at the court, and it was during this period that the natural carelessness of his disposition was shown by his investing in an annuity a present of \$25,000 given him by a court beauty. In 1672, when England to her shame sent 6,000 troops to aid Louis XIV. in his attempt to subdue the Dutch, Churchill formed one of the company, and soon attracted the attention of Turenne, by whose profound military genius the whole army was directed. At the siege of Nimeguen Churchill acquitted himself with such success that the French commander predicted his ultimate rise to distinction. When Maestricht was besieged he saved the life of the duke of Monmouth, and received the thanks of Louis XIV. for his services. Early in 1678 he was married to Sarah Jennings, the favorite attendant on the Princess Anne, the younger daughter of the duke of York. Sarah Jennings had as little money as her husband, but this deficiency was more than compensated for by an abundance of energy and ambition.

On the accession of James II. the Churchills received a great increase in fortune. Colonel Churchill had been created a Scotch peer in 1682, and as a reward for his services in going on a special mission from the new monarch to Louis XIV. he was advanced to the English peerage under the title of Baron Churchill of Sandridge in Hertfordshire, the village in which the Jennings' property was situated. A step in the army was at the same time conferred upon him, and when the duke of Monmouth attempted his ill-fated enterprise in the western counties the second position in command was bestowed on Lord Churchill. Through his vigilance and energy victory declared itself on the king's side. After the death of Monmouth he withdrew as far as possible from the administration of public business. While on his embassy to the French court he had declared with emphasis that if the king of England should change the religion of the state he should at once leave his service, and it was not long before the design of James became apparent to the world. Churchill was one of the first to send overtures of obedience to the prince of Orange. Although he continued in a high position under James, and drew the emoluments of his places, he promised William of Orange to use every exertion to bring over the troops to his side. James had been warned against putting any trust in the loyalty of the man on whom he had showered so many favors, but the warnings were in vain, and on the landing of the

Dutch prince at Brixham Churchill was sent against him with 5,000 men. When the royal army had advanced to the downs of Wiltshire and a battle seemed imminent, James was disconcerted by learning that in the dead of night his general had stolen away like a thief into the opposite camp. For this timely act of treachery Churchill received another advancement in the peerage. He had now become the earl of Marlborough and a member of the privy council. William sent him with the army into the Netherlands and into Ireland. For some time there was no open avowal of any distrust in Marlborough's loyalty, but in May, 1692, the world was astonished at the news that he had been thrown into the Tower on an accusation of treason. Though the evidence which could be brought against him was slight, and he was soon set at liberty, there is no doubt that Marlborough was in close relations with the exiled king at St. Germain's, and that he even went so far as to disclose to his late master the intention of the English to attack the town of Brest. The talents of the statesmen of this reign were chiefly displayed in their attempts to convince both the exiled and the reigning king of England of their attachment to his fortunes. The sin of Marlborough lay in the fact that he had been favored above his fellows by each in turn, and that he betrayed both alike apparently without scruple or without shame. Once again during the Fenwick plot he was charged with treason, but William, knowing that if he pushed Marlborough and his friends to extremities there were no other statesmen on whom he could rely, contented himself with ignoring the confessions of Sir John Fenwick, and with executing that conspirator himself. Not long afterward the forgiven traitor was made governor to the young duke of Gloucester, the only one of Anne's numerous children who gave promise of attaining to manhood. During the last year of William's reign Marlborough once more was placed in positions of responsibility. His daughters were married into the most prominent families of the land; the eldest became the wife of the eldest son of Lord Godolphin; the second married the only son of Lord Sunderland. Higher honors were in store for his family, and they came on the accession of Queen Anne in March, 1702. She had not been more than three days upon the throne before the knighthood of the Garter was conferred upon Marlborough. He was made captain-general of the English troops both at home and abroad, and master-general of the ordnance. The new queen did not forget the life-long service of his wife; three positions at the court by which she was enabled to continue by the side of the sovereign as closely as she had lived with the princess were united in her person. A week or two after the death of William it was agreed by the three great powers, England, Holland, and Austria, which formed the grand alliance, that war should be declared against France, and on May 4, 1702, the declaration was made by the three countries. Marlborough was made commander-in-chief of the united armies of England and Holland. In the first year of the campaign it was shown that the armies of the French were not invincible. Several fortresses which Louis XIV. had seized upon surrendered themselves to the allies. The successes of Marlborough caused much rejoicing in his own country, and for these brilliant exploits he was raised to the highest rank in the peerage, and rewarded with a handsome annuity.

The result of the campaign of 1703 inspired the French king with fresh hopes of ultimate victory. The dashing plans of Marlborough were frustrated by the opposition of his Dutch colleagues. When he wished to invade the French territory they urged him to besiege *Boni*, and he was compelled to accede to their wishes.

After this digression from his first purpose he returned to his original plan of attacking Antwerp; but, in consequence of the incapacity of the Dutch leaders, the generals (Villeroi and Boufflers) of the French army surprised the Dutch division and inflicted on it a loss of many thousands of men. Marlborough was forced to abandon his enterprise, and all the compensation which he received was the capture of the insignificant forts of Huy and Limburg. After a year of comparative failure for the allies, Louis XIV. was emboldened to enter upon an offensive movement against Austria; and Marlborough was eager to meet him. A magnificent army was sent by the French king under the command of Marshal Tallard, with instructions to strike a blow at Vienna itself. Marlborough divined the intention of the expedition, and, without communicating his intentions to his colleagues, led his troops into Bavaria. The two armies (that under Marlborough and Prince Eugène numbering more than 50,000 men, while Tallard's forces were nearly 10,000 stronger) met in battle array near the village of Blenheim. The early part of the fight was in favor of the French. Three times were the troops led by Prince Eugène driven back in confusion; Marlborough's cavalry failed on their first attack in breaking the line of the enemy. But in the end the victory of the allies was conclusive. Nearly 30,000 of the French and Bavarians were killed and wounded, and in Blenheim alone 10,000 were made prisoners. Never was a victory more eagerly welcomed than this, and never was a conquering leader more rewarded than Marlborough. Poets and prose writers were employed to do him honor, and the lines of Addison comparing the English commander to the angel who passed over "pale Britannia" in the storm of 1703 have been famous for nearly two centuries. The manor of Woodstock, which was transferred by Act of Parliament from the crown to the duke, was a reward more after his own heart. The gift even in that form was a noble one, but the queen heightened it by instructing Sir John Yanbrugh to build a palace in the park at the royal expense, and, although the works subsequently caused much anxiety to the duke and duchess, \$1,200,000 of public money was spent on the buildings.

In the following year the battle of Ramillies (May 23, 1707) ended in the total rout of the French, and caused the transference of nearly the whole of Brabant and Flanders to the allies. Five days afterward the victor entered Brussels in state, and the inhabitants acknowledged the rule of the archduke. Antwerp and Ostend surrendered themselves with slight loss. After this victory Marlborough, ever anxious for decisive measures, wished to advance on Paris, but he was overruled. The allied army invested the town of Lille, on the fortifications of which Vauban had expended an immensity of thought; and after a struggle of nearly four months, and the loss of 30,000 men, the citadel surrendered. By the end of the year Brabant was again subject to the rule of the allies. On August 3, 1709, Tournay capitulated, and the two leaders, Marlborough and Eugène, led their forces to Mons, in spite of the attempt of Villars to prevent them. For the last time during the protracted war the two armies met in fair fight at Malplaquet, September 11, 1709, where the French leader had strengthened his position by extensive earthworks. The fight was long and doubtful, and, although the French ultimately retreated under the direction of Boufflers, for Villars had been wounded on the knee, it was in good order, and their losses were less than those of their opponents.

All that Marlborough had effected on the battlefield during these years of war had not prevented his position from being undermined by party intrigues at home. In

the early part of Queen Anne's reign his political friends were to be found among the Tories, and the ministry was chiefly composed of members of that party. After a year or two, however, the more ardent Tories withdrew, and two younger adherents of the same cause, Harley and St. John (both of whom were at present content to conceal their animosity to Marlborough), were introduced into the ministry. The duchess, partly through the influence of her son-in-law, the earl of Sunderland, and partly through the opposition of the Tories to the French war, had gone over to the Whig cause, and she pressed her views on the sovereign with more vehemence than discretion. She had obtained for her indigent cousin, Abigail Hill, a small position at court, and the poor relation very soon began to injure the benefactor who had befriended her. With Hill's assistance Harley and St. John widened the breach with the queen which was commenced by the imperious manner of the duchess. The love of the two friends changed into hate, and no opportunity for humiliating the family of Marlborough was allowed to pass away neglected. Sunderland and Godolphin were the first to fall (July-August, 1710); a few months later the duchess was dismissed from her offices; and, although Marlborough himself was permitted to continue in his position a short time longer, his fall was only delayed until the last day of 1711. Life in England had become so unpleasant that he went to the Continent, and he remained abroad until the death of Anne (August 1, 1714). Then he once more returned to the shores of England and resumed his old military posts, but he took little part in public affairs. At 4 o'clock on the morning of June 16, 1722, he died at Cranbourn Lodge, near Windsor. His widow, to whom must be assigned a considerable share both in his rise and in his fall, survived till October, 1744.

MARLOW, GREAT, a parliamentary borough of Buckinghamshire, England, is finely situated on the Thames, and on a branch of the Great Western Railway, thirty-seven miles west of London and twenty-five south-east of Oxford. Population, 8,000.

MARLOWE, CHRISTOPHER, the father of English tragedy and the creator of English blank verse, was born at Canterbury in February, 1564, and christened on the 26th of that month. The boy was educated at the King's School, Canterbury; matriculated as pensioner of Benet College, Cambridge, March 17, 1581; took the degree of bachelor of arts in 1583, and that of master of arts four years later. Before this date he had produced the first tragedy worthy of that name in our language, and called into existence that highest and most difficult of all its other than lyrical forms of verse, which alone has proved worthy of acceptance among his countrymen as the fit and adequate instrument of tragic drama. His first tragedy of *Tamburlaine the Great*, in two parts, was successively followed by *Doctor Faustus*, *The Jew of Malta*, *Edward the Second*, and *The Massacre at Paris*. The tragedy of *Dido, Queen of Carthage*, was probably completed for the stage after his death by Thomas Nash.

The only authentic record concerning the death of Marlowe is an entry "in the burial-register of the parish church of St. Nicholas," Deptford: "Christopher Marlowe, slain by Francis Archer, June 1, 1593."

MARLY-LE-ROI, chief place of a canton in the department of Seine-et-Oise, France, five miles to the north of Versailles and three miles to the south of St. Germain-en-Laye, is, notwithstanding some fine country houses, a dull and unattractive village of 1,250 inhabitants, which owes all its celebrity to the sumptuous chateau of Louis XIV.

MARMONT, AUGUSTE FRÉDÉRIC LOUIS VIESSE

DE, duke of Ragusa, and marshal of France, one of Napoleon's earliest friends and most trusted generals, was born at Châtillon-sur-Seine, on July 20, 1774. Marmont became General Bonaparte's aide-de-camp, and accompanied him to Italy and Egypt, winning distinction and promotion as general of brigade. In 1799 he left Egypt with Bonaparte to the mercy of the English; he was present at the revolution of the 18th Brumaire, and organized the artillery for the expedition to Italy, which he commanded with great effect at Marengo. For this he was at once made general of division. In 1801 he became inspector-general of artillery, and in 1804 grand officer of the Legion of Honor. In 1805 he received the command of a corps, with which he did good service at Ulm. He was then directed to occupy Dalmatia with his army; he defeated the Russians October 30th, at Castel Nuovo, and occupied Ragusa. In 1807 he was made duke of Ragusa, and in 1809, being summoned up to the help of Napoleon, who was closely beset in the island of Lobau, earned the marshal's baton by his conduct at Wagram. In July, 1810, he was hastily summoned from his palace, where he lived in Eastern luxury, to succeed Masséna in the command of the French army in the north of Spain, called the army of Portugal. The skill with which he maneuvered his army, during the year he commanded it, has always been acknowledged. His relief of Ciudad Rodrigo in the autumn of 1811 in spite of the presence of the English army was a great feat, and in the tactics which preceded the battle of Salamanca he had the best of it. The extension of his left, July 22, 1812, was, however, fatal, and its result was the great defeat of Salamanca, in which Marmont was severely wounded in the right arm and side. He retired to France to recover, and was still hardly cured when, in April, 1813, Napoleon gave him command of the sixth corps. With it he served in the battles of Lützen, Bautzen, and Dresden, and throughout the defensive campaign of 1814, until the last desperate battle before the walls of Paris, from which he drew back his forces to the commanding position of Essonne. Marmont betrayed his trust and suffered for it. On the restoration of the Bourbons he was made a peer of France, and a major-general of the royal guard, and in 1820 a knight of St. Esprit and a grand officer of the order of St. Louis, but he was never trusted, never popular. He was the major-general of the guard on duty in July, 1830, and was ordered to put down with a strong hand any opposition to the ordinances. After persevering for some time he gave way, and allowed the republicans to succeed in their revolution. This defection brought more obloquy upon him, and the Duc d'Angoulême even ordered him under arrest, saying, "Will you betray us, as you betrayed him?" He died in 1852.

MARMONTEL, JEAN FRANÇOIS, one of the most distinguished men of letters in Paris during the latter half of the eighteenth century, was born in Limousin, in 1724, and died in 1799.

MARMORA, SEA OF. See **BLACK SEA**.

MARMOT. The word *marmot* may be considered to include animals belonging to the three following genera:—The true marmots, forming the genus *Arctomys* ("bear-mouse"), so called from the thick-set, bear-like form of its members; the prairie marmots of North America, better known as the "prairie dogs," (*Cynomys*, "dog-mouse"); and the pouched marmots, or soursliks, comprising the genus *Spermophilus*, or seed-lovers, so named from the character of their food. These three genera are all closely allied to each other, and together form the subfamily *Arctomyina* of the great squirrel family, the *Sciuridae*, of which the only other subfamily the *Sciurina*, consists of the true squirrels (*Sciurus*),

and the flying-squirrels (*Pteromys*). The members of the marmot subfamily are confined to the northern hemisphere, and in fact are almost entirely limited to the north temperate zone, in marked contrast to the genera of the subfamily *Sciurinae*, which attain their greatest development in tropical or semi-tropical countries.

MARNE, a department of the northeast of France, made up from Champagne-Pouilleuse, Rémois, Perthois, Vallage, and La Brie-Champenoise, districts formerly belonging to Champagne. Its chief town, Châlons-sur-Marne, is ninety-two miles in a direct line east of Paris, bounded on the west by Seine-et-Marne and Aisne, on the north by Ardennes, on the east by Meuse, on the south by Haute-Marne and Aube. The population in 1901 was 432,850, a decrease of nearly 6,000 since 1896.

MARNE, HAUTE, a department of eastern France, made up for the most part of districts belonging to the former province of Champagne (Bassigny, Perthois, Vallage), with smaller portions of Lorraine and Burgundy, and some fragments of Franche-Comté; the capital, Chaumont, being 133 miles east-southeast from Paris in a direct line, and it is bounded on the northeast by Meuse, on the east by Vosges, on the southeast by Haute-Saône, on the south and southwest by Côte d'Or, on the west by Aube, and on the northwest by Marne.

MAROCCO. See MOROCCO.

MARONITES, an ecclesiastical community, and therefore also, according to the usages of the Christian East, a distinct political or social body, found mainly in or near the Lebanon, acknowledging the headship of the pope and the Latin standard of orthodoxy, but still retaining some peculiar privileges, including the use of a Syriac service—which few even of the priests now understand—and permission for the inferior clergy to marry. Maronite writers, trained either at Rome (in the Maronite college, founded by Gregory XIII. in 1584) or under Roman influences, have not unnaturally striven to prove that their church was always in essential accord with the Church of Rome except in ritual, but there is clear evidence that this is incorrect.

MAROONS. A *negre marron* is defined by Littré as a fugitive slave who betakes himself to the woods; a similar definition of *cimarron* (apparently from *cima*, a mountain top) is given in the *Dictionary* of the Spanish Academy. The old English form of the word is *rymaron*. The designation in modern English is applied almost as a proper name to the descendants of those negroes in Jamaica who, at the first English occupation in the seventeenth century, fled to the mountains.

MAROS-VÁSÁRHELY, a royal free town of Hungary, and capital of the Transylvanian county of Maros-Torda, is situated on the Maros and on the Hungarian Eastern Railway, fifty miles northeast of Hermannstadt. Population, 13,000.

MAROT, CLÉMENT, one of the most agreeable if not one of the greatest poets of France, and a figure of all but the first importance in her literary history, was born at Cahors, the capital of the province of Quercy, some time during the winter of the year 1496-97, and he appears to have been educated at the university of Paris, and to have then begun the study of the law. As early as 1514, before the accession of Francis I., Clément presented to him his *Judgment of Minos*, and shortly afterward he was either styled or styled himself *facteur* (poet) *de la reine* to Queen Claude. In 1524 Marot accompanied Francis on his disastrous Italian campaign. He was wounded and taken at Pavia, but soon released, and he was back again at Paris by the beginning of 1525. He died at Turin in 1544.

MARQUESAS ISLANDS, or MENDANA ISLANDS, an archipelago of twelve islands extending over 200

miles from southeast to northwest, and having a total area of 480 square miles. The lower or true Marquesas group consists of the islands Fatouhiva or Magdalena, Motane or San Pedro, Tahouata or Sta. Christina, and Hivaoa or Dominica, the last with a coast-line of more than sixty miles. With these is often included the rocky islet of Fetohougo or Hood's, lying in mid-channel to the north of Hivaoa. The northwestern or Washington group is formed of seven islands, the four largest being Roa-Poua or Adams, Houahouna or Washington, Noukahiva or Marchand (seventy miles in circumference), and Hiaou. Along the center of each island is a ridge of mountains, sometimes attaining an altitude of 3,500 feet, whence rugged spurs forming deep valleys stretch toward the sea. Except on a few barren peaks the islands are clothed with verdure, and in the valleys, which are well watered with streams and brooks, the vegetation is luxuriant. The flora includes over four hundred known species, many of them identical with those belonging to the Society Islands. The vegetable products comprise bananas, bread-fruit, yams, plantains, wild cotton, bamboos, sugar-cane, cocoa-nut, and dwarf palms, and several kinds of timber trees. The land fauna is, however, very poor: there are few mammals with the exception of dogs, rats, and pigs; and amphibia and insects are also generally scarce. Of twenty species of birds more than half belong to the sea, where animal life is as abundant as at other sub-tropical Polynesian groups.

The climate of the Marquesas, although hot and humid, is not unhealthy. The inhabitants, a native Polynesian race, have in many respects a great affinity to the Tahitians, but excel them in symmetry of form. They live chiefly on bread-fruit, vegetables, and fish, almost entirely neglect agriculture, but rear hogs and fowls in great numbers. At the commencement of the present century the population exceeded 20,000, but since then petty warfare, infectious maladies, and various other causes have greatly reduced its number; and on December 31, 1900, it reached only 4,280.

MARQUETRY. See FURNITURE.

MARQUETTE, a city and port of entry of the United States, and the county seat of Marquette county, Mich., lies on a bluff about twenty-five feet above a bay of Lake Superior, and is a terminus of the Marquette, Houghton and Ontonagon, and the Detroit, Mackinac and Marquette Railroads. Marquette is a place of importance as the chief shipping port for the great iron-ore region of western Michigan (787,150 tons shipped in 1881), and contains a number of blast furnaces, foundries, machine-shops, and powder-mills, while at the same time it has a reputation as a resort for invalids and tourists. A Roman Catholic cathedral, convent, and orphan asylum are among the public buildings. Population (1900), 10,058.

MARQUETTE, JACQUES, a Jesuit missionary and explorer, was born in 1637, at Laon in France, and died May 18, 1675, on the banks of a small stream, now known as the Marquette, which has its mouth on the eastern shore of Lake Michigan. Having joined the Society of Jesus, he sailed for Canada in 1666, spent eighteen months in the vicinity of Three Rivers, founded the mission of Sault Sainte Marie, on Lake Superior, in 1668, and followed the Hurons to Mackinaw in 1671. It is mainly, however, as Joliet's companion in his voyage down the Mississippi in 1673, that Marquette holds a permanent position in the history of discovery in America.

His narrative, first published in Thevenot's *Recueil de Voyages* (Paris, 1681), is printed along with other documents relating to him in Shea's *Discovery and Exploration of the Mississippi Valley* (New York, 1852).

MARQUIS, or MARQUESS, a title and rank of nobility, the second in the order of the British peerage, and therefore next to duke. A marquis is "most honorable," and is styled "my lord marquis." His wife, who also is "most honorable," is a marchioness, and is styled "my lady marchioness." The coronet is a circlet of gold on which rest four leaves and as many large pearls, all of them of equal height and connected.

MARRIAGE, LAW OF. Marriage may be defined here as the act, ceremony, or process by which the legal relationship of husband and wife is constituted. In most if not all legal systems it takes the form of a contract—the mutual assent of the parties being the prominent and indispensable feature of the ceremony. While the consent of parties is universally deemed one of the conditions of a legal marriage, all the incidents of the relationship constituted by the act are absolutely fixed by law. It should be added that, while marriage is generally spoken of by lawyers as a contract, its complete isolation from all other contracts is invariably recognized. Its peculiar position may be seen at once by comparing it with other contracts giving rise to continuous relationships with more or less indefinite obligations, like those of landlord and tenant, master and servant, etc. In these the parties may in general make their rights and duties what they please, the law only intervening when they are silent. In marriage every resulting right and duty is fixed by the law.

In the *Canon Law*, which is related on the one hand to the civil law, on the other to the modern matrimonial law of Europe, although marriage was not merely a contract but a sacrament, the validity of marriages by consent was nevertheless admitted.

In England marriage may be the subject of an ordinary contract on which an action may be brought by either party. It is not necessary that the promise should be in writing, or that any particular time should be named. The parties were formerly inadmissible as witnesses in this action; but they are now competent to give evidence, subject to the condition that the plaintiff shall not recover "unless his or her testimony shall be corroborated by some other material evidence." The ordinary defenses, *e. g.*, fraud, discharge, minority, are available in these actions, and there are also special defenses arising from the nature of the contract, such as the bad character of the plaintiff, the relationship of the parties within the prohibited degrees, etc. Promises to marry are not within the meaning of "agreements made in consideration of marriage" in the statute of frauds, which requires such agreements to be in writing. Contracts in restraint of marriage, *i. e.*, whose object is to prevent a person from marrying anybody whatever, are void, as are also contracts undertaking for reward to procure a marriage between two persons. These latter are termed marriage brokerage contracts.

Any man and woman are capable of marrying, subject to certain disabilities, some of which are said to be canonical as having been formerly under the cognizance of the ecclesiastical courts, others civil. The effect of a canonical disability as such was to make the marriage not void but voidable. The marriage must be set aside by regular process, and sentence pronounced during the lifetime of the parties. Natural inability at the time of the marriage to procreate children is a canonical disability. Civil disabilities are (1) the fact that either party is already married and has a spouse still living; (2) the fact that either party is a person of unsound mind; (3) want of full age, which for this purpose is fixed at the age of puberty as defined in the Roman law, *viz.*, fourteen for males

and twelve for females; (4) proximity of relationship within the prohibited degrees, already alluded to. The prohibitions extend not only to *consanguinei* (related by blood) but to *affines* (related by marriage). A man may neither marry his sister nor deceased wife's sister, for both are related to him in the second degree; nor his sister's daughter, nor his deceased wife's sister's daughter, for both are in the third degree; but he may marry his first cousin, for she is in the fourth. Two brothers may marry two sisters, or a father and son a mother and daughter.

In the United States the absence of ecclesiastical courts has suggested difficulties as to the extent to which the law of England on this subject continued to prevail after the Revolution. "All our marriage and divorce laws, and of course all our statutes on the subject, in so far as they pertain to localities embraced within the limits of particular States, are State laws and State statutes, the national power with us not having legislative or judicial cognizance of the matter within those localities." Some of the States have extended the ages below which marriage cannot take place. The common law of the States is assumed to be that "a contract *per verba de presenti*, or *per verba de futuro cum copula*, constitutes a complete marriage." Conditions, however, may be imposed by the various State legislatures, and as to these the rule has established itself in American jurisprudence that "a marriage good at common law is good notwithstanding the existence of any statute on the subject, unless the statute contains express words of nullity." So when State legislation requires any particular form to be used the want thereof only invalidates the act if the statute expressly so enacts. Many of the State codes inflict penalties on ministers or justices for celebrating the marriage of minors without the consent of the parents or guardians. The original law as to prohibited degrees has been considerably modified in the United States. The prohibition of marriage with a deceased wife's sister is all but unknown in the United States.

The law of marriage which prevails in all the States of the Union is based upon the presumption that marriage is a contract, differing chiefly from all other contracts in the fact that it cannot be annulled by consent of the parties thereto, but only by the judgment of a court, or, possibly yet in some States, by an act of the legislature. The forms prescribed are not essential, being in the nature of evidence rather than essential to validity. Marriage may be legally inferred from the acts of the parties and from declarations made by them. The rule is one of evidence. The Levitical degrees do not generally hold in the States, and the statutory provisions as to competency to contract marriage usually confine themselves to questions of age, or, at most, to those of blood relationship. And a marriage contracted under the statutes of the State where the marriage takes place is good afterwards in a State where such marriage, under the statutes, might not have been lawful in the first place.

But the statutes of many of the States have made radical changes from the harshness of the common law as it related to marriage, and to the relation of husband and wife. Under that law upon marriage the husband acquired an absolute ownership of all the wife's goods, chattels and moneys, and all demands due to her became his as soon as he could acquire possession of them. The wife acquired no corresponding interest in her husband's property. A mode of evading these injustices was contrived by the courts of equity, but the more recent statutes of many of the States, and of all the newer ones, has left this inter-

vention unnecessary. By these it may be said that the *Feme Covert* of the common law has ceased to exist. The real and personal property which a woman owns at the time of her marriage is hers, sole and separate, free from any claim by her husband's creditors. She may convey this property, or devise and bequeath it. In addition, in many of the States she is clothed with the capacity to independently enjoy its proceeds. She may contract or do business on her own account, and sue and be sued as a separate individual. These changes in the common law are revolutionary, as controlling the law of marriage, and the relation of husband and wife.

MARRYAT, FREDERICK, born in 1792, has never been surpassed as a writer of tales of nautical adventure. His own life supplied him with abundant raw materials for his art. He distinguished himself as a boy by frequently running away toward sea; and at last, at the age of fourteen, he was allowed to enter the navy. His first service was under Lord Cochrane in the famous *Impérieuse*, and no midshipman ever had a livelier apprenticeship to the sea. During his two and a half years of service under the daring and active Cochrane, the young midshipman witnessed more than fifty engagements, many of them extremely brilliant, and had experience of every description of service, fighting duels with fairly matched ships of war, engaging gunboats, engaging batteries, storming forts, capturing and cutting out merchantmen. Before the general peace of 1815 he had added considerably to this experience of active service, and gained a wide knowledge of conditions of life on board ship under various commanders. He frequently received honorable mention for his behavior in action, and in 1818 he received the medal of the Humane Society for "at least a dozen" gallant rescues. He commanded with distinction in the Burmese war of 1824-25. And Marryat's honors were not confined to gallant exploits; he was the inventor of a code of signals, obtained some celebrity as a caricaturist, and was elected an F.R.S.

Marryat brought ripe experience and unimpaired vivacity to his work when he began writing fiction. His first production was *Frank Mildmay, or the Naval Officer*, published in 1829, and his second, published nine months later, *The King's Own*. The novels of the sea captain at once won public favor. His first attempt was somewhat severely criticised from an artistic point of view. It was without form, though the reverse of void; he had packed into it matter enough for half a dozen novels. Marryat was accused also of gratifying private grudges by introducing real personages too thinly disguised. He admitted the justice of these criticisms, and rapidly learned the mechanical part of his new business without losing any of the vivacious charm of his style. *The King's Own* was a vast improvement in point of construction, upon *Frank Mildmay*; and he went on, through a quick succession of tales, *Newton Forster*, *Peter Simple*, *Jacob Faithful*, *The Pacha of Many Tales*, *Japhet in Search of a Father*, *Mr. Midshipman Easy*, *The Pirate and the Three Cutters*, till he reached his high-water mark of constructive skill in *Snarley-yow, or the Dog Fiend* (1837). If he never surpassed this in story-telling art, humorous portraiture, and richness of incident, the records of circulating libraries and the penciled comments of their subscribers show that his subsequent works—he produced twenty-four in all during his twenty years of authorship—were no less capable of riveting the attention, especially of youthful readers. The following is the list, with the dates of publication:—*The Phantom Ship* (1839), *A Diary in America* (1839), *Olla Podrida* (1840), *Poor Jack* (1840), *Master-*

man Ready (1841), *Joseph Rushbrook* (1841), *Perceival Keene* (1842), *Monsieur Violet* (1842), *The Settlers in Canada* (1843), *The Privateer's Man* (1844), *The Mission or Scenes in Africa* (1845), *The Children of the New Forest* (1847), *The Little Savage* (1847), and *Valerie*, not completed by Marryat (1849). He died in 1848.

MARS was a Roman deity whose name has passed into later literature as that of the war god. There grew in Rome a tendency, fostered by Greek influence, to consider Jupiter as the one great god, and the other deities as representing special sides of his character. Mars then was identified with the Greek ARES (*q. v.*), and was regarded as almost the same in nature with the warlike element in Jupiter as Feretrius and Triumphantor. In the actual worship of the Romans Mars bears a very different character, which, however, had almost disappeared from the mind of the people before Augustus built in the Forum his temple to Mars Ultor, the avenger of the murder of Julius Cæsar.

Father Mars, Marspiter, Maspiter, Mavors, or Maurs, was the great god of one of the races that composed the Roman state. He is the god of heaven, the giver of light, the opener of the new year; he hurls the thunder and sends the rain. In cases of drought the *lapis manalis*, which was kept in his temple on the Appian Way, was carried through the city by the *pontifices*. The first month of the old Roman year was the month of Mars, still called March. On the first day the god had been born; and on the same day various annual ceremonies both political and religious took place; and the holy fire was renewed in the temple of Vesta.

Next to Jupiter, Mars was the chief protecting god of the Roman state. Quirinus Mars was the father of the twin founders of the city, and his sacred wolf was the emblem of the city and the foster-mother of the twins. The Campus Martius outside the city was dedicated to the god from a very early time; there the young men practiced their warlike exercises; there the horse races, *equiria*, in honor of Mars, and the sacrifice of the "October horse" took place. There also was held the census every fifth year, followed by the purification ceremony for the whole city, which was dedicated to Mars. When war broke out, the Roman general clashed the shield and spear in the temple of Mars and invoked the god; the spoils of victory belonged to him after Jupiter Feretrius.

MARSALA, a seaport on the west coast of Sicily, in the province of Trapani, twenty miles south of Trapani, to the north of the river Marsala, with a station on the railway between Trapani and Palermo. A flourishing and well-built town, with wide paved streets, it possesses a castle, a cathedral, a theater, cavalry barracks (now occupied by government offices), an academy of science and literature, and a public library. From 31,350 in 1861 the population of the commune had increased by 1881 to 40,251; that of the town was 14,105 in 1871, or, with the suburbs of Porta Gartaldi, Porta Mazzara, and Porta Trapani, 17,666.

MARSDEN, WILLIAM, an eminent Oriental scholar, was born at Dublin, in 1754, and died in October, 1836.

MARSEILLAISE, the national hymn of the French, was composed at Strasburg in April, 1792, by ROUGET DE LISLE (*q. v.*), then an engineer officer, who supplied both the words and the music. The song was at first known as the *Chant de l'armée du Rhin* and received its present name through being first sung in Paris by the Provençal volunteers who stormed the Tuileries. This magnificent hymn of liberty came as an inspiration in the stirring days of the Revolution. Its last verse was added by the Girondins, who sang it on their way to the guillotine. Under the Bourbons it was not

allowed to be sung, but the men of 1830 and 1848 marched to its strains. Napoleon III. tried to substitute the puerile *Partant Pour la Syrie* for it, but since September 4, 1870, when it heralded the birth of the Third Republic, it has been officially recognized as the national hymn.

MARSEILLES, the third largest city of France, and the chief commercial port of the Mediterranean, is the chief town of the department of Bouches du Rhône, headquarters of the fifteenth army corps, the seat of a bishop, and of numerous commercial and scientific institutions. The population in 1901 was 494,769.

The port of Marseilles has in all an area of 422 acres, but there are only four and one-half miles of quays, an amount of accommodation quite inadequate for the enormous traffic, now amounting to more than 3,400,000 tons. Protected on the east by Cape Croisette, and on the west by Cape Couronne, the roadstead of Marseilles and its approaches are lighted by six lighthouses, of which the most distant (130 feet high) is eight miles southwest of the town, on the Planier rock. The docks along the Lazaret basin cover an area of forty-five acres, and the company to which they belong also holds a large area of ground for their enlargement, and has exclusive rights over one and one-half to two miles of quays. The warehouses occupy twenty-seven acres of floor space on their several stories, and the 200,000 tons of goods for which they afford storage are easily manipulated by powerful hydraulic machinery wrought by steam. The large steam vessels for trading with Algiers, the Levant, and the farther East lie in La Joliette, but the old harbor still displays the ancient characteristics of Marseilles. The old-fashioned Mediterranean traders with their lateen sails are crowded together in the Rive Neuve Canal to the south, while the sailing vessels of heavy tonnage are moored to the quay by their sterns. At the end of the old harbor opens out La Cannebière, so called from former rope-walks, of which it occupies the site; it is now the liveliest part of the town, where the principal cafés, shops, hotels, naval and commercial agencies, as well as the Bourse, are found.

Despite its antiquity, Marseilles has no ancient monuments. The old cathedral, which superseded a temple of Diana, itself preceded, it is said, by an altar of Baal, has given place to a modern structure, of which the exterior only is completely finished.

Marseilles contains large hospitals. The Hôtel Dieu in the old town was founded in 1188, and rebuilt in 1593; it has 450 beds.

The scientific institutions of the town are also numerous, including a faculty of science, astronomical observatory, a preparatory school of medicine and pharmacy, a musical conservatoire, a school of art, a lyceum, and many private institutions.

The mean temperature of Marseilles is 58° Fahr.; frost is rare, and snow almost unknown. The heat of summer is tempered during the day by the cooling sea breeze. The most disagreeable wind is the mistral, a violent and cold northwest wind, which blows on an average one hundred and thirty-eight times a year, but has at least the advantage of restoring salubrity to the frequently unhealthy shores of the Mediterranean. The sirocco, a southeast wind, blows some sixty times a year; though hot and parching in summer, it softens the winter climate. The east-southeast wind is cold and damp, and brings rain. The Canal de la Durance has greatly modified the climate of Marseilles and its neighborhood, for by restoring vegetation it has increased the fogs and rains; there is now an annual rainfall of nearly twenty-four inches.

Marseilles is at once the largest commercial port of

France and a manufacturing town, working up the raw materials brought in by sea from every part of the world. The leading industry is that of soap-making, which occupies sixty factories with 1,200 artisans, and annually produces 65,000 tons, valued at about \$10,000,000. With this manufacture are connected oil and chemical works; in the former, which employ 2,000 to 2,500 workmen, 55,000 tons of different oils are produced yearly. The chemical works comprise a dozen mills, manufacturing chiefly the salts of soda and concentrated acids. Two thousand operatives are there employed, and the value of their annual production is estimated at \$1,600,000. There are also three sugar refineries, producing 65,000 tons of loaf-sugar, of which more than half is reexported. Sulphur from Sicily too is refined and converted into sticks or flowers of sulphur, to the value of \$400,000. Petroleum refining occupies 100 workmen. Metallurgy is another great industry; a large quantity of ore, imported from Elba, Spain, and Algeria, is smelted in the blast furnaces of St. Louis in the suburbs. The Mediterranean iron-works and yards, together with other private companies, have large workshops for the construction or repair of marine steam-engines and every branch of iron shipbuilding, employing several thousand workmen. Marseilles is a great center for the extraction of silver from lead ore; 16,000 tons of lead and 25 tons of fine silver are separated annually. There are 64 flour-mills with 300 sets of stones, and 100 factories prepare semolina and other cereal pastes, while 34 tanyards dress 500,000 sheep skins and 335,000 goat skins. To this list of industries must be added the manufactories of matches, candles, and wax-lights, with brass foundries, glass-works, and manufactures of coral, and of Oriental hosiery.

The port of Marseilles is the center of numerous lines of steamers. The French company of mail steam packets (*Messageries Maritimes*) dispatch their boats regularly to Italy, Egypt, Réunion, India, China, and the far East, as well as to Greece, Turkey, the Black Sea, Smyrna, and Syria. The Transatlantic Company runs its vessels to Algiers, Tunis, Malta, and the coast of Italy, and has also a regular line between Marseilles and New York. Many private companies have services to Corsica, Algiers, the coast of Languedoc and of Spain, and the Italian Riviera. Other lines connect Marseilles with Brazil and La Plata, Havre, and London. Landward there are two lines of railway to Aix, and a third to Toulon. A navigable canal is greatly needed to connect the port directly with the Rhone, in order to avoid the difficulties of egress from the river, and to make Marseilles the natural outlet of the rich Rhone basin. The countries with which the greatest traffic is maintained are Algeria, Spain, Italy, Turkey, and the Russian ports on the Black Sea; next in order come England, Austria, the western coast of Africa, Réunion, the Cape, British India, Brazil, the Antilles, China, and Senegambia. From the Black Sea, Turkey, and Algeria come the cereals which form the chief imports in point of bulk; from Italy, Spain, the Levant, China, and Japan the silk, which is the import of greatest value (\$20,000,000 yearly). Then follow ores and metals, iron, cast iron, lead, and copper; also wood, raw material for oil manufacture, raw sugar, cattle, wool and cotton, rice, and various dry vegetable foods, petroleum, cocoa, gums, pepper, and other spices, wines and brandies, coal, skins, cod-fish, cheese, and sponges. The principal exports in respect of value are silk, woolen, and cotton fabrics, refined sugars, wines and spirits; those of greatest bulk are cereals in the form of grain or flour, coal, building materials, oil cakes, iron and other manufactures in metal, wines and spirits, oils, glass and crystal, lead, and coffee.

Of the seagoing tonnage, one-third is under the French flag, but the coasting trade, carried on by French sailors alone, is almost half as large as the ocean trade. The shipowners of the port possess almost seven hundred vessels, without counting the hundreds of fishing boats which ply along the coast.

After the ravages of successive streams of invaders, Marseilles, which is said to have been founded by Phœnicians, was repopled in the tenth century under the protection of its viscounts. In 1112 the town bought up their rights, and was formed into a republic, governed by a *podestat*, who was appointed for life, and exercised his office in conjunction with three notables, and a municipal council, composed of eighty citizens, three clerics, and six principal tradesmen. During the rest of the Middle Ages, however, the higher town was governed by the bishop, and had its harbor at the creek of La Joliette. The southern suburb was governed by the abbot of St. Victor, and owned the Port des Catalans. Situated between the two, the lower town, the republic, retained the old harbor, and was the most powerful of the three divisions. The period of the crusades brought great prosperity to Marseilles. The activity of its shipbuilding, the magnitude of its fleet, the importance of its commerce and manufactures, all increased at once. The count of Provence, Raymond Bérenger, Charles of Anjou, and afterward Alphonso of Aragon, successively attempted to make themselves masters of the town; it suffered at different times from incendiarism, pillage, and massacre during the thirteenth and fourteenth centuries and in the beginning of the fifteenth. King René, who had made it his winter residence, however, caused trades, arts, and manufactures again to flourish. Under Francis I., the disaffected constable De Bourbon vainly besieged the town with the imperial forces in 1524. During the wars of religion Marseilles took an active part against the Protestants, and long refused to acknowledge Henry IV. The loss of the ancient liberties of the town brought on new disturbances under the Fronde, which Louis XIV. came in person to suppress. He took the town by storm, and had Fort St. Nicolas constructed. Marseilles repeatedly suffered from the plague, and an epidemic raged from May, 1720, to May, 1721, with a severity for which it is almost impossible to find a parallel; Bishop Belsunce, Chevalier Rose, and others immortalized themselves by their courage and devotion.

During the Revolution the people rose against the aristocracy, who up to that time had governed the commune. In the Terror they rebelled against the convention, but were promptly subdued by General Carteaux. The wars of the empire, by dealing a severe blow to their maritime commerce, excited the hatred of the inhabitants against Napoleon, who accordingly hailed with enthusiasm the return of the Bourbons and the defeat of Waterloo. The news of the latter provoked a bloody reaction in the town against those suspected of imperialism. Since 1815 the prosperity of the city has received a considerable impulse from the conquest of Algeria and the opening of the Suez Canal. The completion of the canal of the Durance has covered with verdure the formerly arid country surrounding the town, and the openings made in the old part of Marseilles have improved its sanitary condition.

MARSH, GEORGE PERKINS, LL.D., American diplomatist and philologist, was born at Woodstock, Vt., March 17, 1801, graduated at Dartmouth College in 1820, and practiced law at Burlington, Vt., devoting himself also with ardor to philological studies. In 1835 he was elected to the State legislature, and in 1842 he became a member of Congress. In 1849 he was appointed United States minister to Turkey,

and in 1852 discharged also a special mission to Greece, returning to Vermont in 1853. In 1861 he became United States minister to Italy, and died in that office at Vallombrosa, July 24, 1882.

MARSHAL (from Old High German *marah*, horse, and *scalc*, care-taker), in its original signification a servant of the royal *manège*, was afterward a title given in different countries to the holder of various high offices, military and civil. In the time of Philip Augustus the commander of the French forces was called the marshal of France. In England the marshal was a high officer of state as far back as the twelfth century.

In Scotland (an orthography resembling the French *maréchal* being adopted) the office of *marischal*, probably introduced under David I., became from the fourteenth century hereditary in the family of Keith. The military title of field-marshal was at first borrowed by the Germans from the French *maréchal de camps*; and in the Thirty Year's War it meant much what quartermaster-general does now. It was not till the last century that the word rose in dignity so as to signify the highest military dignity except that of commander-in-chief. It was adopted into the British military system from Germany—the first field-marshals being John, duke of Argyll, and George, earl of Orkney, made so by George II. in 1736.

MARSHALL, JOHN, chief justice of the United States, was born in Fauquier county, Va., on September 24, 1755. As lieutenant and captain he served in the revolutionary army from 1775 to 1780. In 1781 he began the practice of the law, and two years later removed to Richmond. At various times from 1782 to 1798 he was elected a member of the Virginia legislature, in 1788 a member of the Virginia convention for the ratification of the constitution; in 1797 he was envoy extraordinary to France, and in 1799 a member of Congress; in 1800 he became secretary of state; and on January 31, 1801, he was appointed to the chief-justice-ship, which position he held until his death, on July 6, 1835. Marshall as a lawyer soon rose to the first rank at the Virginia bar, and acquired also a national reputation. In the Virginia convention of 1788 his influence was second only to that of Madison in securing the adoption of the constitution. But, unlike Madison, he continued, under the constitution, to support the administration of Washington and Federalist measures in general. It was as chief justice of the supreme court of the United States, however, that Marshall won lasting fame. His reports, filling about thirty volumes, form a work which time will only render more valued.

MARSHALL, a Michigan city in Calhoun county, of which it is the capital, lies on the Kalamazoo river. It has extensive machine shops, churches, banks, and exceptional school facilities. The town has various manufactures and considerable trade with the surrounding country. It has railroad and telegraph connections. Population (1900), 4,370.

MARSHALL, a city of Texas, in Harris county, of which it is the county seat, is a considerable railroad center, and also a town of some manufacturing importance. It has a large trade in cotton and other agricultural products. It is situated in the midst of a rich farming and mining country, and bids fair to become a town of considerable importance in the near future. Near the town are situated mineral springs of high reputation locally. Population (1900 census), 7,855.

MARSHALL ISLANDS. See MICRONESIA.

MARSHALLTOWN, the county seat of Marshall county, Iowa, is situated on the Iowa river, at the junction of several railways, and in the midst of a grain and stock producing region. Among its numerous industries are sugar-refining, wagon-making, and the manu-

facture of barbed steel wire for fencing purposes. The population was 3,218 in 1870 and 6,240 in 1880, and 11,544 according to the 1900 census.

MARSHMAN, JOSHUA, a Baptist missionary and Oriental scholar, was born on April 20, 1768, at Westbury Leigh, in Wiltshire, England. He died at Serampore, December 5, 1837.

MARSIGLI (Latinized MARSILIUS), LUIGI FERDINAND, soldier and savant, was born at Bologna, July 10, 1658, and died in the same city, November 1, 1730.

MARSTON, JOHN, was one of the most vigorous satirists and dramatists of the Shakespearean age. He was probably some ten years younger than Shakespeare. He has been identified with a gentleman commoner of Brasenose College, Oxford, who entered in 1591, and was admitted B.A. in 1593 as the eldest son of an esquire. 'If this is the same John Marston that was buried in the Temple Church in 1634, under a tombstone *Oblivioni Sacrum*, the identification of him with the poet is most probably right.

MARSYAS was a Phrygian god, whose name has passed into Greek mythology.

MARTEN, the name of a group of animals constituting a small but well-defined section of the family *Mustelide*, belonging to the Arctoid or bear-like division of the order *Carnivora*. In geographical distribution the Martens are limited to the northern hemisphere, ranging throughout the greater part of the northern temperate regions of both Old and New Worlds, as far north as conditions of existence suited to their habits are met with, and southward in America to 35° N. lat., while in Asia one species is met with as far as the island of Java.

The various species appear to be very similar in their habits. They live in woods and rocky places, and are thoroughly arboreal, spending most of their time in trees, although descending to the ground in quest of prey. They climb with great facility, and are agile and graceful in their movements. Some species are said occasionally to resort to berries and other fruit for food, but as a rule they are strictly carnivorous, feeding chiefly on birds and their eggs, small mammals, as squirrels, hares, rabbits, and moles, but chiefly mice of various kinds, of which they destroy great numbers, and occasionally snakes, lizards, and frogs. In proportion to their size they are among the most bloodthirsty of animals, though less so than the true weasels. The female usually makes her nest of moss, dried leaves, and grass in the hollow of a tree, but sometimes in a hole among rocks or ruined buildings, and produces several young at a birth, usually from four to six. Though wild and untamable to a great degree if captured when fully grown, when taken young they are very docile, and have frequently been made pets of, not having the strong, unpleasant odor of the smaller *Mustelide*. The common European marten appears to have been partially domesticated by the Greeks and Romans, and to have been used to keep houses clear from rats and mice before cats were introduced. In the same way, according to Hodgson, an allied species, the Yellow-bellied weasel (*Mustela kathiah*), "is exceedingly prized by the Nepalese for its service in ridding houses of rats."

The North American sable or marten is so closely allied to the European pine marten and Asiatic sable that it is very difficult to assign constant distinguishing characteristics between them. The importance of the fur of this animal as an article of commerce may be judged of from the fact that 15,000 skins were sold in one year by the Hudson's Bay Company as long ago as 1743, and the more recent annual exports have exceeded 100,000. It is ordinarily caught in wooden traps of very simple

construction, being little inclosures of stakes or brush in which the bait is placed upon a trigger, with a short upright stick supporting a log of wood, which falls upon its victim on the slightest disturbance. A line of such traps, several to a mile, often extends many miles. The bait is any kind of meat, a mouse, squirrel, piece of fish, or bird's head. It is principally trapped during the colder months, from October to April, when the fur is in good condition, as it is nearly valueless during the shedding in summer. Doctor Coues tells us that, notwithstanding the persistent and uninterrupted destruction to which the American Sable is subjected, it does not appear to diminish materially in numbers in unsettled parts of the country. It holds its own partly in consequence of its shyness, which keeps it away from the abodes of men, and partly because it is so prolific, bringing forth six to eight young at a litter. Its home is sometimes a den under ground or beneath rocks, but oftener the hollow of a tree, and it is said frequently to take forcible possession of a squirrel's nest, driving off or devouring the rightful proprietor.

MARTIAL (M. VALERIUS MARTIALIS) is a writer to whose merits it is difficult to do justice in the present day. His faults are of the most glaring kind; they are exhibited without the least concealment; and they are of the sort of which modern feeling is most intolerant. Living as he did under perhaps the worst of the many bad emperors who ruled the world in the first century, he addresses him and his favorites with the most servile flattery in his lifetime, reviles him immediately after his death, and offers equally fulsome incense at the shrine of his successor. No writer of equal genius has ever shown such an absence of dignity and independence of character in his relation to his richer friends and patrons. He is not ashamed to be dependent on them for gifts of money, for his dinner, and even for his dress. We cannot feel sure that even what seem his sincerest tributes of regard may not be prompted by the hope of payment. Further, there is no book in any literature which, both in expression and in the things treated of, sins so flagrantly against all instincts of propriety. A certain proportion of the epigrams in every book—perhaps one-fifth or one-sixth (in some books the proportion is much larger)—can be read by no class of readers with any other feelings than those of extreme distaste.

Our knowledge of Martial's life is derived almost entirely from himself. His writings do not, like those of Horace, supply materials for a continuous biography, nor do they lay bare every secret of his heart with the self-absorption of Catullus. But, as he writes frankly about everything that interested him, he has not only painted a very life-like picture, or rather drawn a multitude of very life-like sketches of Roman society in his time, but he has clearly marked his own position in and his own relation to that society. His criticism of men and manners enables us to judge of the standard which he applied to life, of the things which he liked and disliked, and of his own temper and disposition. Reference to public events enables us approximately to fix the date of the publication of the different books of epigrams, and from these dates to determine those of various important events in his life. The date of his birth may be assigned to the year 40 or 41.

MARTIAL LAW. See MILITARY LAW.

MARTIGUES, chief place of a canton in the department of Bouches-du-Rhône, France, stands on the southern shore of the lagoon of Berre, and at the eastern extremity of that of Caronte, by which the former is connected with the Mediterranean. Population (1901), about 10,000.

MARTIN, the *Hirundo urtica* of Linnæus and *Chelidon urtica* of modern ornithologists, a bird very well known throughout Europe, including even Lapland, where it is abundant, retiring in winter to the south of Africa. It also inhabits the western part of Asia, and appears from time to time in large flocks in India. The Martin (or House-Martin, as it is often called, to distinguish it from the Sand-Martin presently to be mentioned) commonly reaches its summer quarters a few days later than the SWALLOW (*q.v.*), whose habits its own so much resemble that heedless persons often disregard the very perceptible differences between them, the Martin's white rump and lower parts being conspicuous as it flies or clings to its "loved mansionry" attached to our houses. This nest, made of the same material as the Swallow's, is, however, a far more difficult structure to rear, and a week or more is often occupied in laying its foundations—the builders clinging to the wall while depositing the mud of which it is composed. But, the base once securely fixed, the superstructure is often quickly added till the whole takes the shape of the half or quarter of a hemisphere, and a lining of soft feathers, mixed with a few bents or straws, fits it for its purpose. The Martin sets about building very soon after its return, and a nest that has outlasted the winter's storms is almost at once reoccupied; though if a new nest be needed its construction often involves great delay, for any excess of wet or drought retards the operation, and the work is generally placed in such an exposed situation that heavy driving rains will wash away the half-dried walls. However, the bird mostly perseveres against these and other troubles, contriving in the course of the summer to raise a second or, rarely, a third brood of offspring—though it is certain that the latest broods often die in the nest—apparently through failure of food.

The Sand-Martin, *Hirundo riparia* of Linnæus and *Cotile riparia* of modern writers, differs much in appearance and habits from the former. Its smaller size, mouse-colored upper surface, and jerking flight ought to render it easily recognizable from the other *Hirundinide*; but through carelessness it is seldom discriminated, and, being the first of the family to return to its northern home, the "early swallow" of newspaper-writers would seem to be nearly always of this species. Instead of the clay-built nest of the House-Martin, this bird bores, with a degree of regularity and an amount of labor rarely excelled in its class, horizontal galleries in a natural or artificial escarpment. When beginning its excavation, it clings to the face of the bank, and with its bill loosens the earth, working from the center outward, assuming all sorts of positions—as often as not hanging head downward. In Europe it is found nearly to the North Cape, and thence to the Sea of Okhotsk. In winter it visits many parts of India, and South Africa to the Transvaal territory. In America its range is even more extraordinary, extending (due regard being of course had to the season of the year) from Melville Island to Caicara, in Brazil, and from Newfoundland to Alaska.

The Purple Martin of America, *Hirundo* or *Progne purpurea*, requires some remarks as being such a favorite bird in Canada and in the United States. Naturally breeding in hollow trees, it readily adapts itself to the nest-boxes which are very commonly set up for its accommodation; but its numbers are in some years and places subject to diminution in a manner which has not yet been satisfactorily explained. The limits of its range in winter are not determined, chiefly owing to the differences of opinion as to the validity of certain supposed kindred species found in South America; but according to some authorities it reaches the border of

Patagonia, while in summer it is known to inhabit lands within the Arctic Circle. The male is almost wholly of a glossy steel-blue, while the female is much duller in color above, and beneath of a brownish-gray.

MARTIN, ST., bishop of Tours, was born of heathen parents at Sabaria in Pannonia, about the year 316. When ten years of age he became a catechumen, and at fifteen, contrary to his own inclination, he entered the army. It was while he was stationed at Amiens that he divided his cloak with the beggar, and on the following night had the vision of Christ making known to his angels this act of charity to Himself. He died about 400.

MARTIN I., pope, succeeded Theodore I., in June or July, 649. He had previously acted as papal apocrisarius at Constantinople, and was held in high repute for learning and virtue. Martin was arrested in the Lateran (June 15, 653), hurried out of Rome, and conveyed first to Naxos and subsequently to Constantinople (September 17, 654). He was ultimately banished to Cherson, where he arrived March 26, 655, and died on September 16th following. His successor was Eugenius I.

MARTIN II. See MARINUS I.

MARTIN III. See MARINUS II.

MARTIN IV., pope from 1281 to 1285, was the successor of Nicholas III. He was a native of Touraine, born about 1210, and his proper name was Simon de Brion. After holding various offices at Rouen and Tours, he was made chancellor of France by Louis IX. in 1260, and cardinal by Urban IV. in 1261. He acted as legate for this pope, and also for his successor Clement IV. After the death of Nicholas III. (August, 1280,) Charles of Anjou was able to secure the election of Cardinal Simon by the conclave at Viterbo (February 22, 1281). The Romans declined to receive him within their walls, and he was crowned at Orvieto. At the instance of Charles, whose tool he had become, he in November, 1281, excommunicated the emperor Michael Palæologus, who stood in the way of French projects against Greece—an act by which the union of the Eastern and Western churches was rendered impossible. For three years after the Sicilian Vespers in 1282 all the spiritual and material resources at his command were in vain employed on behalf of his patron against Peter of Aragon. He died at Perugia on March 25, 1285, and was succeeded by Honorius IV.

MARTIN V. (Otto di Colonna), pope from 1417 to 1431, was elected on St. Martin's day at Constance by a conclave, which after deposing John XXIII. had long experienced much perplexity from the conflicting claims of Gregory XII. and Benedict XIII. He died on February 20, 1431. His successor was Eugenius IV.

MARTIN, JOHN, a popular English painter, was born near Hexham, July 19, 1789. Martin removed to London in 1806, where he married at the age of nineteen, and led a struggling life, supporting himself by giving drawing lessons, and by painting in water colors, and on china and glass. His leisure was occupied in the study of perspective and architecture. His first picture, *Sadak in Search of the Waters of Oblivion*, was executed in a month. It was exhibited in the Royal Academy of 1812, and sold for fifty guineas. It was followed by the *Expulsion* (1813), *Paradise* (1813), *Clytie* (1814), and *Joshua* (1815). In 1821 appeared the famous *Belshazzar's Feast*, which excited much favorable and hostile comment, and was awarded a prize of £200 at the British Institute, where the *Joshua* had previously carried off a premium of £100. Then came *The Destruction of Herculaneum* (1822), *The Creation* (1824), *The Eve of the Deluge* (1841), and a long series of other Biblical and imaginative subjects,

many of which are widely known through engravings. In 1832-33 Martin received £2,000 for drawing and engraving a fine series of designs to Milton, and along with Westall he produced a set of Bible illustrations. During the last four years of his life he was engaged upon his large subjects of *The Judgment*, *The Day of Wrath*, and *The Plains of Heaven*. He was attacked with paralysis while painting, and died in the Isle of Man on February 17, 1854.

MARTINA FRANCA, a city of Italy in the province of Lecce, eighteen miles north of Taranto, on a hill near the sources of the Tara. The population of the city was 13,088 in 1861; that of the commune has increased from 16,637 in that year to 21,257 in 1901.

MARTINEAU, HARRIET, English woman of letters, was born at Norwich in 1802. The atmosphere of her home was industrious, intellectual, and austere; she herself was clever, weakly, and unhappy, and was, moreover, already growing deaf. In 1821 she began to write anonymously for the *Monthly Repository*, a Unitarian periodical, and was assured by her brother that authorship was her proper career. A little later she published *Devotional Exercises and Addresses, Prayers, and Hymns*.

She reviewed for the *Repository* at the rate of £15 a year, wrote stories (afterward collected as *Traditions of Palestine*), gained in one year (1830) three essay-prizes of the Unitarian Association, and eked out her income by needlework. In 1831 she was seeking a publisher for a series of tales designed as *Illustrations of Political Economy*. Till 1834 she continued to be occupied with her political economy series and with a supplemental series of *Illustrations of Taxation*. Four stories dealing with the poor-law came out about the same time. These tales, direct, lucid, written without any appearance of effort, and yet practically effective, display the characteristic qualities of their author's style. In 1834, when the whole series was complete, Miss Martineau paid a long visit to America. Here her open adhesion to the Abolitionist party, then small and very unpopular, gave great offense, which was deepened by the publication, soon after her return, of *Society in America* and a *Retrospect of Western Travel*. An article in the *Westminster Review*, "The Martyr Age of the United States," introduced English readers almost for the first time to the struggles of the Abolitionists. The American books were followed by a novel, *Deerbrook*. To the same period belong two or three little handbooks, forming parts of a *Guide to Service*.

In 1839, during a visit to the Continent, Miss Martineau's health, which had long been bad, broke down entirely. She retired to solitary lodgings in Tynemouth, and remained a prisoner to her couch till 1844. She was still busy, and, besides a novel (*The Hour and the Man*), published some tales for children, and *Life in the Sick-room*. In 1845 she published three volumes of *Forest and Game Law Tales*, in which the method of her political economy series was again applied. In 1849 she made an Eastern tour with some friends. She was abroad for eight months, visiting Egypt, Palestine, and Syria, and on her return published *Eastern Life*. She published about this time *Household Education*, expounding the modern theory, in which freedom and rationality, rather than command and obedience, are regarded as the most effectual instruments of education. At the request of Mr. Charles Knight she wrote for him, in 1849, *The History of the Thirty Years' Peace*—a characteristic instance of Miss Martineau's remarkable powers of labor.

In 1851 Miss Martineau edited a volume of *Letters on the Laws of Man's Nature and Development*. The new philosophical bent of her studies directed Miss

Martineau's attention to the works of Comte, and she undertook a condensed English version of the *Philosophie Positive*. It appeared in 1853, and to most readers is more useful and intelligible than the original. She had begun in the previous year to write articles, chiefly biographical, for the *Daily News*. Among these were the *Letters from Ireland*, written during a visit to that country in the summer of 1852. She also wrote a considerable number of essays upon different manufactures for *Household Words*, and another series for the same periodical upon the treatment of blindness, deafness, idiocy, etc., besides a *Guide to Windermere*, followed afterward by a *Complete Guide to the Lakes*. She had been for many years a contributor to the *Westminster Review*, and was one of the little band of supporters whose pecuniary assistance, in 1854, prevented its extinction or forced sale. In the early part of 1855 Miss Martineau found herself suffering from heart disease. Having always felt it one of her duties to write her autobiography, and believing the time before her to be but brief, she now at once set about this task, and on its completion caused the book to be printed that it might be ready for speedy publication at her death. But her life, which she supposed to be so near its close, was prolonged for other twenty years, her death not taking place until 1876.

MARTINI, GIOVANNI BATTISTA, the most learned musician of the eighteenth century, was born at Bologna on April 25, 1706. His father, Antonio Maria Martini, a violinist, taught him very early the elements of music, and to play the violin; at a later period he learned singing and harpsichord playing from Padre Pradieri, and counterpoint from Antonio Riccieri. Having received his education in classics from the fathers of the oratory of San Filippo Neri, he afterward entered upon a novitiate at the Franciscan monastery at Lago, at the close of which he was received into that order on September 11, 1722. Continuing his studies in the theory and practice of music with great zeal, he, in 1725, though only nineteen years of age, received the appointment of chapel-master in the Franciscan church at Bologna, where his compositions soon attracted much attention. At the invitation of amateurs and professional friends he now opened a school of musical composition, at which in the course of his long life several celebrated musicians were trained, including Paolucci, Sabbatini, Ruttini, Zanotti, Sarti, Ottani, and Stanislas Mattei; as a teacher he consistently declared his preference for the traditions of the old Roman school of musical composition. Padre Martini was a zealous and indefatigable collector of musical literature, and is alleged to have been the possessor of the most extensive musical library ever formed. After a lingering illness he died at Bologna on August 4, 1784.

MARTINI, SIMONE, called also Simone di Martino, and more commonly, but not correctly, Simon Memmi, was born in 1283. He followed the manner of painting proper to his native Siena, as improved by Duccio, which is essentially different from the style of Giotto and his school, and the idea that Simone was himself a pupil of Giotto is therefore wide of the mark. Died, 1344.

MARTINIQUE, one of the West India islands, belonging to the chain of the Lesser Antilles, and constituting a French colony, lies thirty-three miles south of Dominica and twenty-two north of Saint Lucia. The greatest length is forty-three miles, the mean width nineteen; and the surface comprises 244,090 acres, or 380 square miles. A cluster of volcanic mountains in the north, a similar group in the south, and a line of lower heights between them, form the backbone of the island, which culminates in the northwest in Mont Pelée, and has altogether a much more irregular and

strongly marked relief than it presents to the eye—the deep ravines and precipitous escarpments with which it abounds being reduced in appearance to gentle undulations by the drapery of the forests. Of the numerous streams which traverse the few miles of country between the watershed and the sea, about seventy or eighty are of considerable size, and in the rainy season become deep and too often destructive torrents. The east coast of the island, exposed to the full sweep of the Atlantic, is a succession of inlets, headlands, islands, and rocks; the south coast is much more regular, but bold and steep; and the west alone presents, in the bay of Fort de France, a stretch of mangrove swamp. Of the total area, about 83,990 acres are under cultivation, 83,843 occupied by forest and savanna, and 68,837 by fallow. In the early summer of 1902, St. Pierre was destroyed, with its 25,000 inhabitants, by a violent eruption of the volcano of Mont Pelée. St. Pierre was visited by two volcanic hurricanes, one occurring at 8.02 a.m. May 8th, and the other at 5.15 a.m. May 20th, the force and destructive violence of both visitations being appalling. The later eruption threw down everything that the earlier one had left standing and turned the already wrecked city into a mass of shapeless ruins. Population of island (1895), 189,600.

MARTINSBURG, the capital of Berkeley county, W. Va., is situated on Tuscarora Creek, in the Shenandoah Valley, eighty miles west of Washington. It contains a National and two other banks, carriage factories, foundries, distilleries, and machine-shops, has three newspapers, railroad and telegraph facilities, and a population (1900) of 7,564.

MARTIN'S FERRY, a village of Belmont county, Ohio, six miles north of Bellaire. It contains important glassworks, said to be the largest in the United States, and has two banks, manufactures of engines and agricultural implements, and foundries. Population (1900), 7,760.

MARTIUS, CARL FRIEDRICH PHILIPP VON born in 1794, a well-known German botanist and traveler in Brazil. He studied in the university of Erlangen, and on graduating M.D. in 1814, published as his thesis a critical catalogue of plants in the botanic garden of the university. He afterward devoted himself to botanical study, and in 1817, he and Spix were sent to Brazil by the king of Bavaria. They traveled from Rio Janeiro through several of the southern and eastern provinces of Brazil, and ascended the river Amazon to Tabatinga, as well as some of its larger affluents. In 1820 they returned to Europe with rich collections of plants and animals, as also with stores of information on the geography, ethnology, and products of Brazil. In 1820 he was appointed conservator of the botanic garden at Munich, and in 1826, professor of botany in the university there, and held both offices till 1854, when he resigned them. He died in 1868.

MARTOS, a town of Spain, in the province of Jaen, is situated on the slope of a steep hill, which is surmounted by a ruined castle, sixteen miles west-south-west of Jaen. Population, 14,654.

MARTYN, HENRY, a celebrated missionary, was born at Truro, Cornwall, February 18, 1781. He died October 6, 1812.

MARTYROLOGY, a catalogue or list of martyrs, arranged according to the succession of their anniversaries, and sometimes including an account of their lives and sufferings. The corresponding word in the Greek Church is *Menologion* or *Analogion*; from the *Menologia* the *Synaxaria* are compiled. The custom of paying honor to the memory of those who had "witnessed the good confession" in perilous times established itself very

early in the Christian church, and one particular manner of commemoration was formally recognized by at least one ecclesiastical synod before the end of the fourth century.

MARULLUS, MICHAEL TARCHANIOTA, one of the most brilliant scholars of the golden age of Florentine learning, was born at Constantinople, and at an early age, on the fall of his native city, was brought to Ancona in Italy, where he became the intimate friend and pupil of Pontanus, with whom his name is associated by Ariosto. He was a soldier and a poet, and in the latter capacity published epigrams and *hymni naturales*. Marullus took no part in the work of translation, then so favorite an exercise of scholars, but he was understood to be planning some great work when he perished, April 10, 1500, in the river Cecina, near Volterra.

MARUM, MARTIN VAN, a distinguished Dutch man of science, born at Delft, in 1750. The work by which he is best known is his *Treatise on Electricity* (Groningen, 1776), in which all that had then been discovered in that science was carefully methodized. He died in 1837.

MARUTSE-MABUNDA, a kingdom in South Africa, with an area estimated at 123,590 square miles. It all belongs to the basin of the Zambesi, and by far the greater portion lies to the north of that river, which forms its southeastern boundary from the mouth of the Linyanti to the mouth of the Kafue, a distance of about 350 miles. The kingdom thus includes the main part of the territory formerly subject to the Makololo empire, which broke up on the death of Sekeletu in 1864.

MARVELL, ANDREW, was born on March 31, 1621, at the parsonage of Winestead in Holderness, England. He was educated at Hull grammar school by his father, who had obtained high position in that town, until his admission to Trinity College, Cambridge, on December 14, 1633. His first employment was in 1650, as tutor to Lord Fairfax's daughter. During his stay at Nunappleton were written the *Poems of the Country*, and some of the *Poems of Imagination and Love*. In 1652 he was in communication with Milton, to whom he had probably been introduced by Fairfax. Marvell accepted the Commonwealth as a practical fact, and the rule of Cromwell as the only guarantee for government at once tolerant and strong. But he never lost his belief in the monarchical theory. The assistant secretaryship opened the way to public life, and in 1658 Marvell was elected member for Kingston-upon-Hull in Richard Cromwell's parliament. From 1663 to 1665 he acted as secretary to Lord Carlisle's embassy to Muscovy, Sweden, and Denmark; and this is the only official post he ever filled during the reign of Charles. With the exception of this and of shorter unexplained intervals of travel, Marvell was constant in his parliamentary attendance to the day of his death.

During these years Marvell wrote a good deal of verse, chiefly satire, often very coarse, but always vigorous and full of an honest hatred of corruption. *The Growth of Popery and Arbitrary Power*, published in the year of his death, is a grave indictment of the conduct of ministers of the crown, and by implication, of Charles himself, since the Restoration. So shrewdly did this strike the conscience of the king that a proclamation, of which Marvell takes laughing notice, offered a large reward for the discovery of the author. As a political pamphleteer Marvell holds a high place; as a satirist he stands still higher. He died suddenly in 1678 on his return from Hull to take his seat in August. That he was poisoned, and at the instigation of the court, has been roundly asserted, naturally enough, though without the slightest foundation.

MARWAR. See JODHPUR.

MARY, the mother of Jesus, at the time when the gospel history begins, had her home in Galilee, at the village of Nazareth. Of her parentage nothing is recorded in any extant historical document of the first century, for the genealogy in Luke iii. is manifestly that of Joseph. In early life she became the wife of JOSEPH (*q.v.*) and also the mother of our Lord (see JESUS); that she afterward had other children is a natural inference from Matthew i. 25, which the evangelists, who frequently allude to "the brethren of the Lord," are at no pains to obviate. The few incidents mentioned in Scripture regarding her show that she followed our Lord to the very close of His earthly career with unflinching motherliness, but the "Magnificat" assigned to her in Luke i. is the only passage which would distinctly imply on her part a high prophetic appreciation of His divine mission. She was present at the crucifixion, where she was commended by Jesus to the care of the apostle John, Joseph having apparently died before this time. Mary is mentioned in Acts i. 14 as having been among those who continued in prayer along with the apostles at Jerusalem during the interval between the ascension and pentecost. There is no allusion in the New Testament to the time or place of her death.

It seems probable that the epithet ("Mother of God") was first applied to Mary by theologians of Alexandria toward the close of the third century; but it does not occur in any genuine extant writing of that period, unless we are to assign an early date to the apocryphal *Transitus Mariæ*, in which the word is of frequent occurrence. In the fourth century it is met with frequently, being used by Eusebius, Athanasius, Didymus, and Gregory of Nazianzus—the latter declaring that the man who believes not Mary to have been *θεοτόκος* has no part in God. If, as is not unlikely, its use was first recommended by a desire to bring into prominence the divinity of the Incarnate Word, there can be no doubt that latterly the expression came to be valued as directly honorable to Mary herself and as corresponding to the greatly increased esteem in which she personally was held throughout the Catholic world, so that, when Nestorius and others began to dispute its propriety in the following century, their temerity was resented, not as an attack upon the established orthodox doctrine of the Nicene creed, but as threatening a more vulnerable and more tender part of the popular faith. The causes which in the course of the preceding century led to this exaltation of the Mother of God in the esteem of the Catholic world are not far to seek. On the one hand the solution of the Arian controversy, however correct it may have been theoretically, undoubtedly had the practical effect of relegating the God-man redeemer for ordinary minds into a faraway region of "remote and awful Godhead," so that the need for a mediator to deal with the very Mediator could not fail to be felt. On the other hand, it must be accepted as a fact abundantly proved by history that the religious instincts of mankind are very ready to pay worship, in grosser or more refined forms, to the idea of womanhood; at all events many of those who became professing Christians at the political fall of paganism entered the church with such instincts (derived from the nature-religions in which they had been brought up) very fully developed. Probably it ought to be added that the comparative colorlessness with which the character of Mary is presented not only in the canonical gospels, but even in the most copious of the apocrypha, left greater scope for the untrammelled exercise of devout imagination than was possible in the case of Christ, in the circumstances of whose humiliation and in whose recorded utterances there were many things which the religious consciousness found difficulty in

understanding or in adapting itself to. At all events, from the time of the council of Ephesus, to exhibit figures of the Virgin and Child became the approved expression of orthodoxy, and the relationship of motherhood in which Mary had been formally declared to stand to God was instinctively felt to give the fullest and freest sanction of the church to that invocation of her aid which had previously been resorted to only hesitatingly and occasionally.

MARY I., queen of England, unpleasantly remembered as "the Bloody Mary" on account of the religious persecutions sanctioned under her reign, was a woman whose private history demands no less compassion than her policy as queen (if indeed it was her own) merits the condemnation of a more humane and tolerant age. She was the daughter of Henry VIII. and Catherine of Aragon, born in the earlier years of their married life, when as yet no cloud had darkened the prospect of Henry's reign. Her birth occurred at Greenwich, February 18, 1516, and she was baptized on the following Wednesday, Cardinal Wolsey standing as her godfather. She seems to have been a singularly precocious child, and is reported in July, 1520, when she was little more than four years of age, as entertaining some visitors by a performance on the virginals. When she was little over nine she was addressed in a complimentary Latin oration by commissioners sent over from Flanders on commercial matters, and replied to them in the same language "with as much assurance and facility as if she had been twelve years old." Her father, against whom it cannot be said that he depreciated learning, had taken care to give her an excellent education, and was proud of her achievements. About the same time that she replied to the commissioners in Latin he was arranging that she should learn Spanish, Italian, and French. A great part, however, of the credit of her early education was undoubtedly due to her mother, who not only consulted the Spanish scholar Vives upon the subject, but was herself Mary's first teacher in Latin. She was also well instructed in music, and among her principal recreations as she grew up was that of playing on the virginals and lute.

Mary was little more than two years old when she was proposed in marriage to the dauphin, son of Francis I. Three years afterward the French alliance was broken off, and she was affianced to her cousin the young emperor Charles V. by the treaty of Windsor. In 1526 a rearrangement was made of the royal household, and it was thought right to give Mary an establishment of her own along with a council on the borders of Wales, for the better government of the Marches. She was now proposed as a wife, not for the dauphin as before, but for his father Francis I., who had just been redeemed from captivity at Madrid, and who was only too glad of an alliance with England to mitigate the severe conditions imposed on him by the emperor. Wolsey, however, on this occasion, only made use of the princess as a bait to enhance the terms of the compact, and left Francis free in the end to marry the emperor's sister.

It was during this negotiation, as Henry afterward pretended, that the question was first raised whether Henry's own marriage with Catherine was a lawful one. (See HENRY VIII., *ante*.) The alliance itself, however, was actually concluded by a treaty dated Westminster, April 30, 1527, in which it was provided, as regards the Princess Mary, that she should be married either to Francis himself or to his second son Henry, duke of Orleans. But the real object was only to lay the foundation of a perfect mutual understanding between the two kings, which Wolsey soon after went to France to confirm.

During the next nine years the life of Mary, as well as that of her mother, was rendered miserable by the conduct of Henry VIII. in seeking a divorce. Her very life was in danger from the hatred of Anne Boleyn. Her health, moreover, was indifferent, and even when she was seriously ill, although Henry sent his own physician, Doctor Buttes, to attend her, he declined to let her mother visit her. So also, at her mother's death in January, 1536, she was forbidden to take a last farewell of her. But in May following another change occurred which seemed to promise some kind of relief. Anne Boleyn, the real cause of all her miseries, fell under the king's displeasure and was put to death. Mary was then urged to make a humble submission to her father as the means of recovering his favor, and after a good deal of correspondence with the king's secretary, Cromwell, she actually did so, and subscribed an act of submission, acknowledging the king as supreme, repudiating the pope's authority, and confessing that the marriage between her father and mother "was by God's law and man's law incestuous and unlawful."

No act, perhaps, in the whole of Henry's reign gives us a more painful idea of his revolting despotism. Mary was a high-spirited girl, and undoubtedly popular. All Europe looked upon her at that time as the only legitimate child of her father, but her father himself compelled her to disown the title and pass an unjust stigma on her own birth and her mother's good name. Nevertheless Henry was now reconciled to her, and gave her a household in some degree suitable to her rank. During the rest of the reign we hear little about her except in connection with a number of new marriage projects taken up and abandoned successively. Although she was still treated as of illegitimate birth, it was believed that the king, having obtained from parliament the extraordinary power to dispose of the crown by will, would restore her to her place in the succession, and three years before his death she was so restored by statute, but still under conditions to be regulated by her father's will.

Under the reign of her brother Edward VI. she was again subjected to severe trials, which at one time made her seriously meditate taking flight and escaping abroad. In spite of the forced declaration formerly rung from herself, no one really regarded her as a bastard, and the full recognition of her rights depended on the recognition of the pope as head of the church. Hence, when Edward's parliament passed an Act of Uniformity enjoining services in English and communion in both kinds, the law appeared to her totally void of authority, and she insisted on having mass in her own private chapel under the old form. When ordered to desist, she appealed for protection to the emperor, Charles V., who, being her cousin, intervened for some time not ineffectually, threatening war with England if her religious liberty was interfered with. But Edward's court was composed of factions of which the most violent eventually carried the day. Lord Seymour, the admiral, was attainted of treason and beheaded in 1549. His brother, the Protector Somerset, met with the same fate in 1552. Dudley, duke of Northumberland, then became paramount in the privy council, and easily obtained the sanction of the young king to those schemes for altering the succession which led immediately after his death to the usurpation of Lady Jane Grey. Dudley had, in fact, overawed all the rest of the privy council, and when the event occurred he took such energetic measures to give effect to the scheme that Lady Jane was actually recognized as queen for some days, and Mary had even to fly from Hoddesden into Norfolk. But the country was really devoted to **her cause**, as indeed her right in law was unquestion-

able, and before many days she was royally received in London, and took up her abode within the Tower.

Her first acts at the beginning of her reign displayed a character very different from that which she still holds in popular estimation. Her clemency toward those who had taken up arms against her was altogether remarkable. She released from prison Lady Jane's father, Suffolk, and had difficulty even in signing the warrant for the execution of Northumberland. Lady Jane herself she fully meant to spare, and did spare till after Wyatt's formidable insurrection. Following the emperor Charles V.'s guidance, she determined almost from the first to make his son Philip her husband, though she was eleven years his senior. She was also strongly desirous of restoring the old religion and wiping out the stigma of illegitimacy passed upon her birth, so that she might not seem to reign by virtue of a mere parliamentary settlement.

But the marriage promised to throw England into the arms of Spain and place the resources of the kingdom at the command of the emperor's son. The Commons sent her a deputation to entreat that she would not marry a foreigner, and when her resolution was known insurrections broke out in different parts of the country. Suffolk, whose first rebellion had been pardoned, proclaimed Lady Jane Grey again in Leicestershire, while young Wyatt raised the county of Kent, and actually besieged the queen in her own palace at Westminster. In the midst of the danger Mary showed great intrepidity, and the rebellion was presently quelled; after which, unhappily, she got leave to pursue her own course unchecked. She married Philip, restored the old religion, and got Cardinal Pole to come over and absolve the kingdom for its past disobedience to the Holy See.

The misgivings of those who had disliked the Spanish match were more than sufficiently justified by the course of events. Mary yielded a loyal and womanly devotion to a husband who did not too greatly esteem the treasure of her person. Her health, which was feeble before, was bad for the remainder of her days, and she fell under a delusion at first that it was owing to an approaching confinement. Disappointment and vexation probably added to her helplessness. The resources of the kingdom were at Philip's command, and he even took ships of the English fleet to escort his father, the emperor, on his abdication, to Spain. More extraordinary still, he ultimately succeeded in committing England to a war against France, when France had made an alliance with the pope against him as king of Spain; so the very marriage which was to confirm England in the old religion led to a war against the occupant of the see of Rome. And it was this war with France which produced the final calamity of the loss of Calais which sank so deeply into Mary's heart some months before she died.

The cruel persecution of the Protestants, which has cast so much infamy upon her reign, began about six months after her marriage; and it is not difficult to see that it was greatly due to the triumph of ideas imported from the land of the Inquisition. Rogers, the first of the martyrs, was burnt on February 4, 1555. Hooper, bishop of Gloucester, had been condemned six days before, and suffered the same fate upon the 9th. From this time the persecution went on uninterrupted for more than three years, numbering among its victims Ridley, Latimer, and Cranmer. It seems to have been most severe in the eastern and southern parts of England, and the largest number of sufferers was naturally in the diocese of Bonner, bishop of London. From first to last nearly 300 victims are computed to have perished at the stake; and their fate certainly created a revulsion

against Rome that nothing else was likely to have effected. How far Mary herself—who, during the most part of this time, was living in the strictest seclusion, sick in body and mind, hysterical and helpless—was personally answerable for these things, it is difficult to say. To her, no doubt, the propagators of heresy were the enemies of mankind, and she had little cause to love them from her own experience. Yet perhaps she hardly realized the full horror of what was done under her sanction. But there can be little doubt what effect it had upon the people; and when Mary breathed her last, on November 17, 1558, the event was hailed with joy as a national deliverance.

MARY II., queen of England, was the eldest daughter of James, duke of York (afterward James II. of England), by his first wife Anne Hyde, and was born in London on April 30, 1662. Having been educated in the Protestant faith, she was married to William, prince of Orange, on November 4, 1677. After the events of 1688 she followed her husband to England, and was proclaimed by the convention joint sovereign with him on February 13, 1689. She died of smallpox on December 28 (O.S.), 1694. (See WILLIAM III.)

MARY, queen of Scots, daughter of King James V. and his wife Mary of Lorraine, was born in December, 1542, a few days before the death of her father. On September 9th following, the ceremony of coronation was duly performed upon the infant. A scheme for her betrothal to Edward, prince of Wales, was defeated by the grasping greed of his father, whose obvious ambition to annex the crown of Scotland at once to that of England aroused instantly the general suspicion and indignation of Scottish patriotism. In 1548 the queen of six years old was betrothed to the dauphin Francis, and set sail for France, where she arrived on August 15th. The society in which the child was thenceforward reared is known to the readers of Brantôme as well as that of imperial Rome at its worst is known to readers of Suetonius or Petronius. Only in their pages can a parallel be found to the gay and easy record which reveals without sign of shame or suspicion of offense the daily life of a court compared to which the court of King Charles II. is as the court of Queen Victoria to the society described by Grammont. Debauchery of all kinds, and murder in all forms, were the daily matter of excitement or of jest to the brilliant circle which revolved around Queen Catherine de' Medici. After ten years' training under the tutelage of the woman whose main instrument of policy was the corruption of her own children, the queen of Scots, aged fifteen years and five months, was married to the eldest and feeblest of the brood on April 24, 1558. On November 17th Elizabeth became queen of England, and the princes of Lorraine—Francis the great duke of Guise, and his brother the cardinal—induced their niece and her husband to assume, in addition to the arms of France and Scotland, the arms of a country over which they asserted the right of Mary Stuart to reign as legitimate heiress of Mary Tudor. Civil strife broke out in Scotland between John Knox and the queen dowager—between the self-styled "congregation of the Lord" and the adherents of the regent, whose French troops repelled the combined forces of the Scotch and their English allies from the beleaguered walls of Leith, little more than a month before the death of their mistress in the castle of Edinburgh, on June 10, 1560. On August 25th Protestantism was proclaimed and Catholicism suppressed in Scotland by a convention of states assembled without the assent of the absent queen. On December 5th Francis II. died; in August, 1561, his widow left France for Scotland, having been refused a safe-conduct by Elizabeth on the ground of her own

previous refusal to ratify the treaty made with England by her commissioners in the same month of the preceding year. She arrived, nevertheless, in safety at Leith, escorted by three of her uncles of the house of Lorraine, and bringing in her train her future biographer, Brantôme, and Chastelard, the first of all her voluntary victims. On August 21st she first met the only man able to withstand her; and their first passage of arms left, as he has recorded, upon the mind of John Knox an ineffaceable impression of her "proud mind, crafty wit, and indurate heart against God and His truth."

By the influence of Lord James Stuart, in spite of the earnest opposition of Knox, permission was obtained for her to hear mass celebrated in her private chapel—a license to which, said the Reformer, he would have preferred the invasion of 10,000 Frenchmen. Through all the first troubles of her reign the young queen steered her skillful and dauntless way with the tact of a woman and the courage of a man. An insurrection in the north, headed by the earl of Huntly under pretext of rescuing from justice the life which his son had forfeited by his share in a homicidal brawl, was crushed at a blow by the Lord James. Exactly four months after the battle of Corrichie, and the subsequent execution of a criminal whom she is said to have "loved entirely," had put an end to the first insurrection raised against her, Pierre de Boscose de Chastelard, who had returned to France with the other companions of her arrival, and in November, 1562, had revisited Scotland, expiated with his head the offense or the misfortune of a second detection at night in her bed-chamber. In the same month, twenty-five years afterward, the execution of his mistress, according to the verdict of her contemporaries in France, avenged the blood of a lover who had died without uttering a word to realize the apprehension which (according to Knox) had before his trial impelled her to desire her brother "that, as he loved her, he would slay Chastelard, and never let him speak word." And in the same month, two years from the date of Chastelard's execution, her first step was unconsciously taken on the road to Fotheringay, when she gave her heart at first sight to her kinsman Henry, Lord Darnley, son of Matthew Stuart, earl of Lennox, who had suffered an exile of twenty years in expiation of his intrigues with England, and had married the niece of King Henry VIII., daughter of his sister Margaret, the widow of James IV., by her second husband, the earl of Angus. Queen Elizabeth, with the almost incredible want of tact or instinctive delicacy which distinguished and disfigured her vigorous intelligence, had recently proposed as a suitor to the queen of Scots her own low-born favorite, Lord Robert Dudley, the widower if not the murderer of Amy Robsart; and she now protested against the project of marriage between Mary and Darnley. Mary, who had already married her kinsman in secret at Stirling Castle with Catholic rites celebrated in the apartment of David Rizzio, her secretary for correspondence with France, assured the English ambassador, in reply to the protest of his mistress, that the marriage would not take place for three months, when a dispensation from the pope would allow the cousins to be publicly united without offense to the church.

On July 29, 1565, they were accordingly remarried at Holyrood. The hapless and worthless bridegroom had already incurred the hatred of two powerful enemies, the earls of Morton and Glencairn; but the former of these took part with the queen against the forces raised by Murray, Glencairn, and others, under the nominal leadership of Hamilton, duke of Chatelherault, on the double plea of danger to the new religion of the country, and of the illegal proceeding by which Darnley had been proclaimed king of Scots without the needful con-

stitutional assent of the estates of the realm. Murray was cited to attend the "raid" or array levied by the king and queen, and was duly denounced by public blast of trumpet for his non-appearance. He entered Edinburgh with his forces, but failed to hold the town against the guns of the castle, and fell back upon Dumfries before the advance of the royal army, which was now joined by James Hepburn, earl of Bothwell, on his return from a three years' outlawed exile in France. He had been accused in 1562 of a plot to seize the queen and put her into the keeping of the earl of Arran, whose pretensions to her hand ended only when his insanity could no longer be concealed. Another new adherent was the son of the late earl of Huntly, to whom the forfeited honors of his house were restored a few months before the marriage of his sister to Bothwell. The queen now appealed to France for aid; but Castelnau, the French ambassador, replied to her passionate pleading by sober and earnest advice to make peace with the malcontents. This counsel was rejected, and in October, 1565, the queen marched an army of 18,000 men against them from Edinburgh; their forces dispersed in face of superior numbers, and Murray, on seeking shelter in England, was received with contumely by Elizabeth, whose half-hearted help had failed to support his enterprise, and whose intercession for his return found at first no favor with the queen of Scots. But the conduct of the besotted boy on whom at their marriage she had bestowed the title of king began at once to justify the enterprise and to play into the hands of all his enemies alike. His father set him on to demand the crown matrimonial, which would at least have assured to him the rank and station of independent royalty for life. Rizzio, hitherto his friend and advocate, induced the queen to reply by a reasonable refusal to this hazardous and audacious request. Darnley at once threw himself into the arms of the party opposed to the policy of the queen and her secretary—a policy which at that moment was doubly and trebly calculated to exasperate the fears of the religious and the pride of the patriotic. Mary was invited if not induced by the king of Spain to join his league for the suppression of Protestantism; while the actual or prospective endowment of Rizzio with Morton's office of chancellor, and the projected attainder of Murray and his allies, combined to inflame at once the anger and the apprehension of the Protestant nobles. According to one account, Darnley privately assured his uncle George Douglas of his wife's infidelity; he had himself, if he might be believed, discovered the secretary in the queen's apartment at midnight, under circumstances yet more unequivocally compromising than those which had brought Chastelard to the scaffold. A bond was drawn in which Darnley pledged himself to support the confederates who undertook to punish "certain privy persons" offensive to the state, "especially a stranger Italian called Davie." On March 9th the palace of Holyrood was invested by a troop under the command of Morton, while Rizzio was dragged by force out of the queen's presence and slain. The parliament was discharged by a proclamation issued in the name of Darnley as king; and in the evening of the next day the banished lords, whom it was to have condemned to outlawry, returned to Edinburgh. On the day following they were graciously received by the queen, who undertook to sign a bond for their security, but delayed the subscription till next morning under plea of sickness. During the night she escaped with Darnley, whom she had already seduced from the party of his accomplices, and arrived at Dunbar on the third morning after the slaughter of her favorite. From there they returned to Edinburgh on March 28th, guarded by 2,000 horsemen under the command of Bothwell, who had escaped

from Holyrood on the night of the murder, to raise a force on the queen's behalf with his usual soldierly promptitude. The slayers of Rizzio fled to England, and were outlawed; Darnley was permitted to protest his innocence and denounce his accomplices; after which he became the scorn of all parties alike, and few men dared or cared to be seen in his company. On June 19th a son was born to his wife, and in the face of his previous protestations he was induced to acknowledge himself the father. But, as Murray and his partisans returned to favor and influence no longer incompatible with that of Bothwell and Huntly, he grew desperate enough to dream of escape to France. This design was at once frustrated by the queen's resolution. She summoned him to declare his reasons for it in the presence of the French ambassador and an assembly of the nobles; she besought him for God's sake to speak out, and not spare her; and at last he left her presence with an avowal that he had nothing to allege. The favor shown to Bothwell had not yet given occasion for scandal, though his character as an adventurous libertine was as notable as his reputation for military hardihood; but as the summer advanced his insolence increased with his influence at court and the general aversion of his rivals. He was richly endowed by Mary from the greater and lesser spoils of the church; and the three wardenships of the border, united for the first time in his person, gave the lord high admiral of Scotland a position of unequaled power. In the gallant discharge of its duties he was dangerously wounded by a leading outlaw, whom he slew in single combat; and while yet confined to Hermitage Castle he received a visit of two hours from the queen, who rode thither from Jedburgh and back through twenty miles of the wild borderland, where her person was in perpetual danger from the freebooters. The result of this daring ride was a ten days' fever, after which she removed by short stages to Craigmillar, where a proposal for her divorce from Darnley was laid before her by Bothwell, Murray, Huntly, Argyle, and Lethington, who was chosen spokesman for the rest. She assented on condition that the divorce could be lawfully effected without impeachment of her son's legitimacy; whereupon Lethington undertook in the name of all present that she should be rid of her husband without any prejudice to the child, at whose baptism a few days afterward Bothwell took the place of the putative father, though Darnley was actually residing under the same roof, and it was not till after the ceremony that he was suddenly struck down by a sickness so violent as to excite suspicions of poison. He was removed to Glasgow, and left for the time in charge of his father; but on the news of his progress toward recovery a bond was drawn up for execution of the sentence of death which had secretly been pronounced against the twice-turned traitor who had earned his doom at all hands alike. On the 22d of the next month (January, 1567) the queen visited her husband at Glasgow and proposed to remove him to Craigmillar Castle, where he would have the benefit of medical baths; but instead of this resort he was conveyed on the last day of the month to the lonely and squalid shelter of the residence which was soon to be made memorable by his murder. Between the ruins of two sacred buildings, with the town-wall to the south and a suburban hamlet known to ill fame as the Thieves' Row to the north of it, a lodging was prepared for the titular king of Scotland. On the evening of Sunday, February 9th, Mary took her last leave of the miserable boy who had so often and so mortally outraged her as consort and as queen. That night the whole city was shaken out of sleep by an explosion of gunpowder which shattered to fragments the building

in which he should have slept and perished; and next morning the bodies of Darnley and a page were found strangled in a garden adjoining it, whither they had apparently escaped over a wall, to be dispatched by the hands of Bothwell's attendant confederates.

Upon the view which may be taken of Mary's conduct during the next three months depends the whole debatable question of her character. According to the professed champions of that character, this conduct was a tissue of such dastardly imbecility, such heartless irresolution, and such brainless inconsistency as forever to dispose of her time-honored claim to the credit of intelligence and courage. It is certain that just three months and six days after the murder of her husband she became the wife of her husband's murderer. On February 11th she wrote to the bishop of Glasgow, her ambassador in France, a brief letter of simple eloquence, announcing her providential escape from a design upon her own as well as her husband's life. A reward of £2,000 was offered by proclamation for discovery of the murderer. Bothwell and others, his satellites or the queen's, were instantly placarded by name as the criminals. Voices were heard by night in the streets of Edinburgh calling down judgment on the assassins. Four days after the discovery of the bodies, Darnley was buried in the chapel of Holyrood with secrecy as remarkable as the solemnity with which Rizzio had been interred there less than a year before. On the Sunday following, Mary left Edinburgh for Seton Palace, twelve miles from the capital. The demands of Darnley's father for justice on the murderers of his son were accepted and eluded by his daughter-in-law. Bothwell, with a troop of fifty men, rode through Edinburgh defiantly denouncing vengeance on his concealed accusers. As weeks elapsed without action on the part of the royal widow, while the cry of blood was up throughout the country, raising echoes from England and abroad, the murmur of accusation began to rise against her also. Murray, with his sister's ready permission, withdrew to France. Already the report was abroad that the queen was bent on marriage with Bothwell, whose last marriage with the sister of Huntly would be dissolved, and the assent of his wife's brother purchased by the restitution of his forfeited estates.

On March 28th the privy council, in which Bothwell himself sat, appointed April 12th as the day of his trial, Lennox, instead of the crown, being named as the accuser, and cited by royal letters to appear at "the humble request and petition of the said Earl Bothwell," who, on the day of the trial, had 4,000 armed men behind him in the streets, while the castle was also at his command. Under these arrangements it was not thought wonderful that Lennox discreetly declined the danger of attendance, even with 3,000 men ready to follow him, at the risk of desperate street fighting. He pleaded sickness, asked for more time, and demanded that the accused, instead of enjoying special favor, should share the treatment of other suspected criminals. But, as no particle of evidence on his side was advanced, the protest of his representative was rejected, and Bothwell, acquitted in default of witnesses against him, was free to challenge any persistent accuser to the ancient ordeal of battle. His wealth and power were enlarged by gift of the parliament which met on the 14th and rose on April 19th. On the second day following, Mary went to visit her child at Stirling, where his guardian, the earl of Mar, refused to admit more than two women in her train. It was well known in Edinburgh that Bothwell had a body of men ready to intercept her on the way back, and carry her to Dunbar—not, as was naturally inferred, without good assurance of her consent. On April 24th, as she approached Edinburgh, Bothwell accordingly

met her at the head of 800 spearmen, assured her (as she afterward averred) that she was in the utmost peril, and escorted her, together with Huntly, Lethington, and Melville, who were then in attendance, to Dunbar Castle. On May 3d Lady Jane Gordon, who had become countess of Bothwell on February 22d of the year preceding, obtained, on the ground of her husband's infidelities, a separation which, however, would not under the old laws of Catholic Scotland have left him free to marry again; on the 7th, accordingly, the necessary divorce was pronounced, after two days' session, by a clerical tribunal which ten days before had received from the queen a special commission to give judgment on a plea of somewhat apocryphal consanguinity alleged by Bothwell as the ground of an action for divorce against his wife. On the day when the first or Protestant divorce was pronounced, Mary and Bothwell returned to Edinburgh with every prepared appearance of a peaceful triumph. Lest her captivity should have been held to invalidate the late legal proceedings in her name, proclamation was made of forgiveness accorded by the queen to her captor in consideration of his past and future services, and her intention was announced to reward them by further promotion; and on the same day (May 12th) he was duly created duke of Orkney and Shetland.

That the coarse and imperious nature of the hardy and able ruffian who had now become openly her master should no less openly have shown itself even in the first moments of their inauspicious union is what any bystander of common insight must inevitably have foreseen. Tears, dejection, and passionate expressions of a despair "wishing only for death," bore fitful and variable witness to her first sense of a heavier yoke than yet had galled her spirit and her pride. On June 6th or 7th Mary and Bothwell took refuge in Borthwick Castle, twelve miles from the capital, where the fortress was in the keeping of an adherent whom the diplomacy of Sir James Melville had succeeded in detaching from his allegiance to Bothwell. The fugitives were pursued and beleaguered by the earl of Morton and Lord Hume, who declared their purpose to rescue the queen from the thralldom of her husband. He escaped, leaving her free to follow him or to join the party of her professed deliverers. But whatever cause she might have found since marriage to complain of his rigorous custody and domineering brutality was insufficient to break the ties by which he held her. Alone, in the disguise of a page, she slipped out of the castle at midnight, and rode off to meet him at a tower two miles distant, whence they fled together to Dunbar. The confederate lords on entering Edinburgh were welcomed by the citizens, and after three hours' persuasion Lethington, who had now joined them, prevailed on the captain of the castle to deliver it also into their hands. Proclamations were issued in which the crime of Bothwell was denounced, and the disgrace of the country, the thralldom of the queen, and the mortal peril of her infant son were set forth as reasons for summoning all the lieges of the chief cities of Scotland to rise in arms on three hours' notice and join the forces assembled against the one common enemy. News of his approach reached them on the night of June 14th, and they marched before dawn with 2,200 men to meet him near Musselburgh. Mary meanwhile had passed from Dunbar to Haddington, and thence to Seton, where 1,600 men rallied to her side. On June 15th, one month from their marriage day, the queen and Bothwell, at the head of a force of fairly equal numbers but visibly inferior discipline, met the army of the confederates at Carberry Hill, some six miles from Edinburgh. Du Croc, the French ambassador, obtained permission through the influence of Mail-

land to convey to the queen the terms proposed by their leaders—that she and Bothwell should part, or that he should meet in single combat a champion chosen from among their number. At last it was agreed that the queen should yield herself prisoner, and Bothwell be allowed to retire in safety to Dunbar with the few followers who remained to him. Mary took leave of her first and last master with passionate anguish and many parting kisses.

In Edinburgh she was received by a yelling mob, which flaunted before her at each turn a banner representing the corpse of Darnley with her child beside it invoking on his knees the retribution of divine justice. At nine in the evening she was removed to Holyrood, and thence to the port of Leith, where she embarked under guard, with her attendants, for the island castle of Lochleven. On the 20th a silver casket containing letters and French verses, miscalled sonnets, in the handwriting of the queen, was taken from the person of a servant who had been sent by Bothwell to bring it from Edinburgh to Dunbar. Three days after this discovery Lord Lindsay, Lord Ruthven, and Sir Robert Melville were dispatched to Lochleven, there to obtain the queen's signature to an act of abdication in favor of her son, and another appointing Murray regent during his minority. She submitted, and a commission of regency was established till the return from France of Murray, who, on August 15th, arrived at Lochleven with Morton and Athole. The necessary removal of George Douglas from Lochleven enabled him to devise a method of escape for the prisoner on March 25, 1568, which was frustrated by detection of her white hands under the guise of a laundress. But a younger member of the household, Willie Douglas, aged eighteen, whose devotion was afterward remembered and his safety cared for by Mary at the time of utmost risk and perplexity to herself, succeeded on May 2d in assisting her to escape by a postern gate to the lake-side, and thence in a boat to the mainland, where George Douglas, Lord Seton, and others were awaiting her. Thence they rode to Seton's castle of Niddry, and next day to Hamilton Palace, round which an army of 6,000 men was soon assembled, and whither the new French ambassador to Scotland hastened. The queen's abdication was revoked, messengers were dispatched to the English and French courts, and word was sent to Murray at Glasgow that he must resign the regency, and should be pardoned in common with all offenders against the queen. But on the day when Mary arrived at Hamilton, Murray had summoned to Glasgow the feudatories of the crown, to take arms against the insurgent enemies of the infant king. Elizabeth sent conditional offers of help to her kinswoman, provided she would accept of English intervention and abstain from seeking foreign assistance; but the messenger came too late. Mary's followers had failed to retake Dunbar Castle from the regent, and made for Dumbarton instead, marching two miles south of Glasgow, by the village of Langside. Here Murray, with 4,500 men, under leaders of high distinction, met the 6,000 of the queen's army.

On May 13th, the battle or skirmish of Langside determined the result of the campaign in three-quarters of an hour. Kirkcaldy of Grange, who commanded the regent's cavalry, seized and kept the place of vantage from the beginning, and at the first sign of wavering on the other side shattered at a single charge the forces of the queen, with a loss of one man to three hundred. Mary fled sixty miles from the field of her last battle before she halted at Sanquhar. On the third day from the rout of Langside she crossed the Solway, and landed at Workington, in Cumberland, May 16, 1568. On the

20th, Lord Scrope and Sir Francis Knollys were sent from court to carry messages and letters of comfort from Elizabeth to Mary at Carlisle. On July 15th, after various delays interposed by her reluctance to leave the neighborhood of the border, where on her arrival she had received the welcome and the homage of the leading Catholic houses of Northumberland and Cumberland, she was removed to Bolton Castle in North Yorkshire. During her residence here a conference was held at York between her own and Elizabeth's commissioners and those appointed to represent her son as king of Scots. These latter, of whom Murray himself was the chief, privately laid before the English commissioners the contents of the famous casket. On October 24th, the place of the conference was shifted from York to London, where the inquiry was to be held before Queen Elizabeth in council. Mary was already aware that the chief of the English commissioners, the duke of Norfolk, was secretly an aspirant to the peril of her hand; and on October 21st, she gave the first sign of assent to the suggestion of a divorce from Bothwell. On October 26th, the charge of complicity in the murder of Darnley was distinctly brought forward against her in spite of Norfolk's reluctance and Murray's previous hesitation. Elizabeth, by the mouth of her chief justice, formally rebuked the audacity of the subjects who durst bring such a charge against their sovereign, and challenged them to advance their proofs. They complied by the production of an indictment under five heads, supported by the necessary evidence of documents. The number of English commissioners was increased, and they were bound to preserve secrecy as to the matters revealed. Further evidence was supplied by Thomas Crawford, a retainer of the house of Lennox, tallying so exactly with the text of the casket letters as to have been cited in proof that the latter must needs be a forgery. Elizabeth, on the close of the evidence, invited Mary to reply to the proofs alleged before she could be admitted to her presence; but Mary simply desired her commissioners to withdraw from the conference. She declined with scorn the proposal made by Elizabeth through Knollys, that she should sign a second abdication in favor of her son. On January 10, 1569, the judgment given at the conference acquitted Murray and his adherents of rebellion, while affirming that nothing had been proved against Mary—a verdict accepted by Murray as equivalent to a practical recognition of his office as regent for the infant king. This position he was not long to hold; and the fierce exultation of Mary at the news of his murder gave to those who believed in her complicity with the murderer, on whom a pension was bestowed by her unblushing gratitude, fresh reason to fear, if her liberty of correspondence and intrigue were not restrained, the likelihood of a similar fate for Elizabeth. On January 26, 1569, she had been removed from Bolton Castle to Tutbury in Staffordshire, where proposals were conveyed to her, at the instigation of Leicester, for a marriage with the duke of Norfolk, to which she gave a graciously conditional assent; but the discovery of these proposals consigned Norfolk to the Tower, and on the outbreak of an insurrection in the north, Mary, by Lord Hunsdon's advice, was again removed to Coventry, when a body of her intending deliverers was within a day's ride of Tutbury. On January 23d following, Murray was assassinated; and a second northern insurrection was crushed in a single sharp fight by Lord Hunsdon. In October Cecil had an interview with Mary at Chatsworth, when the conditions of her possible restoration to the throne in compliance with French demands were debated at length. The queen of Scots, with dauntless dignity, refused to yield the castles of Edinburgh and Dumbarton into

English keeping, or to deliver up her fugitive English partisans then in Scotland; upon other points they came to terms, and the articles were signed October 16th. On the same day Mary wrote to Elizabeth, requesting with graceful earnestness the favor of an interview which might reassure her against the suggestion that this treaty was a mere pretense. On November 28th she was removed to Sheffield Castle, where she remained for the next fourteen years in charge of the earl of Shrewsbury. The detection of a plot, in which Norfolk was implicated, for the invasion of England by Spain on behalf of Mary, who was then to take him as the fourth and most contemptible of her husbands, made necessary the reduction of her household and the stricter confinement of her person. On May 28, 1572, a demand from both houses of parliament for her execution as well as Norfolk's was generously rejected by Elizabeth.

A treaty projected on the news of the massacre of St. Bartholomew, by which Mary should be sent back to Scotland for immediate execution, was broken off by the death of the earl of Mar, who had succeeded Lennox as regent; nor was it found possible to come to acceptable terms on a like understanding with his successor Morton, who in 1577 sent a proposal to Mary for her restoration, which she declined, in suspicion of a plot laid to entrap her by the policy of Sir Francis Walsingham, the most unscrupulously patriotic of her English enemies, who four years afterward sent word to Scotland that the execution of Morton, so long the ally of England, would be answered by the execution of Mary. But on that occasion Elizabeth again refused her assent either to the trial of Mary or to her transference from Sheffield to the Tower. In 1581 Mary accepted the advice of Catherine de' Medici and Henry III. that she should allow her son's title to reign as king of Scotland conjointly with herself when released and restored to a share of the throne. This plan was but part of a scheme including the invasion of England by her kinsman the duke of Guise, who was to land in the north and raise a Scottish army to place the released prisoner of Sheffield beside her son on the throne of Elizabeth. After the overthrow of the Scottish accomplices in this notable project, Mary poured forth upon Elizabeth a torrent of pathetic and eloquent reproach for the many wrongs she had suffered at the hands of her hostess, and pledged her honor to the assurance that she now aspired to no kingdom but that of heaven. In the spring of 1583 she retained enough of this saintly resignation to ask for nothing but liberty, without a share in the government of Scotland. In the autumn of 1584 she was removed to Wingfield Manor under charge of Sir Ralph Sadler and John Somers, who accompanied her also on her next removal to Tutbury in January, 1585.

On Christmas Eve she was removed from the hateful shelter of Tutbury to the castle of Chartley in the same county. Her correspondence in cipher from there with her English agents abroad, intercepted by Walsingham and deciphered by his secretary, gave eager encouragement to the design for a Spanish invasion of England under the prince of Parma. Anthony Babington, in his boyhood a ward of Shrewsbury, resident in the household at Sheffield Castle, and thus subjected to the charm before which so many victims had already fallen, was now induced to undertake the deliverance of the queen of Scots by the murder of the queen of England. On September 25th she was removed to the strong castle of Fotheringay, in Northamptonshire. On October 6th she was desired by letter from Elizabeth to answer the charges brought against her before certain of the chief English nobles appointed to sit in commission on the cause. In spite of her first refusal to submit, she was induced by the arguments of the vice-

chamberlain, Sir Christopher Hatton, to appear before this tribunal on condition that her protest should be registered against the legality of its jurisdiction over a sovereign, the next heir of the English crown.

On October 14 and 15, 1586, the trial was held in the hall of Fotheringay Castle. Alone, "without one counselor on her side among so many," Mary conducted the whole of her own defense. Pathos and indignation, subtlety and simplicity, personal appeal and political reasoning, were the alternate weapons with which she fought against all odds of evidence or inference, and disputed step by step every inch of debatable ground. She repeatedly insisted on the production of proof in her own handwriting as to her complicity with the project of the assassins who had expiated their crime on the 20th and 21st of the month preceding. When the charge was shifted to the question of her intrigues with Spain, she took her stand resolutely on her right to convey whatever right she possessed, though now no kingdom was left her for disposal, to whomsoever she might choose. One single slip she made in the whole course of her defense; but none could have been more unluckily characteristic and significant. When Burghley brought against her the unanswerable charge of having at that moment in her service, and in receipt of an annual pension, the instigator of a previous attempt on the life of Elizabeth, she had the unwary audacity to cite in her justification the pensions allowed by Elizabeth to her adversaries in Scotland, and especially to her son. It is remarkable that just two months later, in a conversation with her keepers, she again made use of the same extraordinary argument in reply to the same inevitable imputation, and would not be brought to admit that the two cases were other than parallel.

Finally she demanded, as she had demanded before, a trial either before the estates of the realm lawfully assembled, or else before the queen in council. So closed the second day of the trial; and before the next day's work could begin a note of two or three lines hastily written at midnight informed the commissioners that Elizabeth had suddenly determined to adjourn the expected judgment and transfer the place of it to the star-chamber. Here, on October 25th, the commissioners again met; and one of them alone, Lord Zouch, dissented from the verdict by which Mary was found guilty of having, since June 1st, preceding, compassed and imagined divers matters tending to the destruction of Elizabeth. This verdict was conveyed to her, about three weeks later, by Lord Buckhurst and Robert Beale, clerk of the privy council. At the intimation that her life was an impediment to the security of the received religion, "she seemed with a certain unwonted alacrity to triumph, giving God thanks, and rejoicing in her heart that she was held to be an instrument" for the restoration of her own faith. This note of exultation as in martyrdom was maintained with unflinching courage to the last. She wrote to Elizabeth and the duke of Guise two letters of almost matchless eloquence and pathos, admirable especially for their loyal and grateful remembrance of all her faithful servants. Between the date of these letters and the day of her execution well nigh three months of suspense elapsed. Elizabeth, fearless almost to a fault in face of physical danger, constant in her confidence even after discovery of her narrow escape from the poisoned bullets of household conspirators, was cowardly even to a crime in face of subtler and more complicated peril. She rejected with resolute dignity the intercession of French envoys for the life of the queen-dowager of France; she allowed the sentence of death to be proclaimed, and welcomed with bonfires and bell-ringing throughout the length of England; she yielded a res-

pite of twelve days to the pleading of the French ambassador, and had a charge trumped up against him of participation in a conspiracy against her life; at length, on February 1, 1587, she signed the death-warrant, and then made her secretaries write word to Paulet of her displeasure that in all this time he should not, of himself, have found out some way to shorten the life of his prisoner, as in duty bound by his oath, and thus relieve her singularly tender conscience from the guilt of bloodshed. Paulet, with loyal and regretful indignation, declined the disgrace proposed to him in a suggestion "to shed blood without law or warrant;" and on February 7th the earls of Shrewsbury and Kent arrived at Fotheringay with the commission of the council for execution of the sentence given against his prisoner. Mary received the announcement with majestic tranquillity, expressing in dignified terms her readiness to die, her consciousness that she was a martyr for her religion, and her total ignorance of any conspiracy against the life of Elizabeth. At night she took a graceful and affectionate leave of her attendants, distributed among them her money and jewels, wrote out in full the various legacies to be conveyed by her will, and charged her apothecary Gorion with her last messages for the king of Spain. In these messages the whole nature of the woman was revealed. Not a single friend, not a single enemy, was forgotten; the slightest service, the slightest wrong, had its place assigned in her faithful and implacable memory for retribution or reward. Forgiveness of injuries was as alien from her fierce and loyal spirit as forgetfulness of benefits; the destruction of England and its liberties by Spanish invasion and conquest was the strongest aspiration of her parting soul. At eight next morning she entered the hall of execution, having taken leave of the weeping envoy from Scotland, to whom she gave a brief message for her son; took her seat on the scaffold, listened with an air of even cheerful unconcern to the reading of her sentence, solemnly declared her innocence of the charge conveyed in it and her consolation in the prospect of ultimate justice, rejected the professional services of Richard Fletcher, dean of Peterborough, lifted up her voice in Latin against his in English prayer, and when he and his fellow-worshippers had fallen duly silent prayed aloud for the prosperity of her own church, for Elizabeth, for her son, and for all the enemies whom she had commended overnight to the notice of the Spanish invader; then, with no less courage than had marked every hour and every action of her life, received the stroke of death from the wavering hand of the headsman.

MARYBOROUGH, a town of Queensland, Australia, in the county of March, on the left bank of the Mary river, twenty-five miles from its mouth, about 180 miles north of Brisbane. Pop. (1901), 12,900.

***MARYLAND**, named for Queen Henrietta Maria, consort of Charles I., of England, was one of the original thirteen States of the American Union, and was the first to ratify the Federal Constitution.

Description.—Maryland is the northernmost of the South Atlantic States. It is bounded on the north by Pennsylvania, on the east by Delaware and the Atlantic Ocean, on the south by Virginia and West Virginia, and on the west by West Virginia. It is divided at the south from Virginia and West Virginia by the Potomac River. All the other lines are arbitrarily drawn. The form of the State is one of the most irregular in the Union. Chesapeake Bay and the Susquehanna River divide it into two parts, called the Eastern and Western Shores. At one point the Potomac River approaches the Pennsylvania line so closely as to leave Maryland less than five miles wide. The State lies between 37° 52' and 39° 45' north latitude, and 75° 2' and 79° 33' longitude west from Greenwich. Its area is 9,860 square miles of land and 2,350 of water. The surface of the

land is greatly variegated. The eastern and southern parts are low and level, and afford fertile farming land, while the western part is mountainous and rugged. The climate is mild and healthful. Snow falls in all parts of the State, but intense cold is seldom known. The entire area is well watered, by the Potomac, Susquehanna, Patuxent, Patapsco, Choptank and other rivers, and by Chesapeake Bay. The yearly rainfall is about 48 inches. The Atlantic coast affords no harbors, but numerous minor harbors are found on Chesapeake Bay and the tributary waters, and one, Baltimore, at the head of the estuary of the Patapsco River, is of first-class importance.

Resources and Products.—The lowlands of Maryland are fertile agricultural lands, and produce all the crops of temperate regions in abundance. The highlands and mountain regions are also fertile and productive, and are likewise rich in minerals. The latter include semi-bituminous coal, iron, marble, cement, slate, granite, and fire-clay. The Chesapeake and other waters afford some of the best fishing grounds of the Atlantic coast, and also oyster beds of great value. Live stock of all kinds is largely raised.

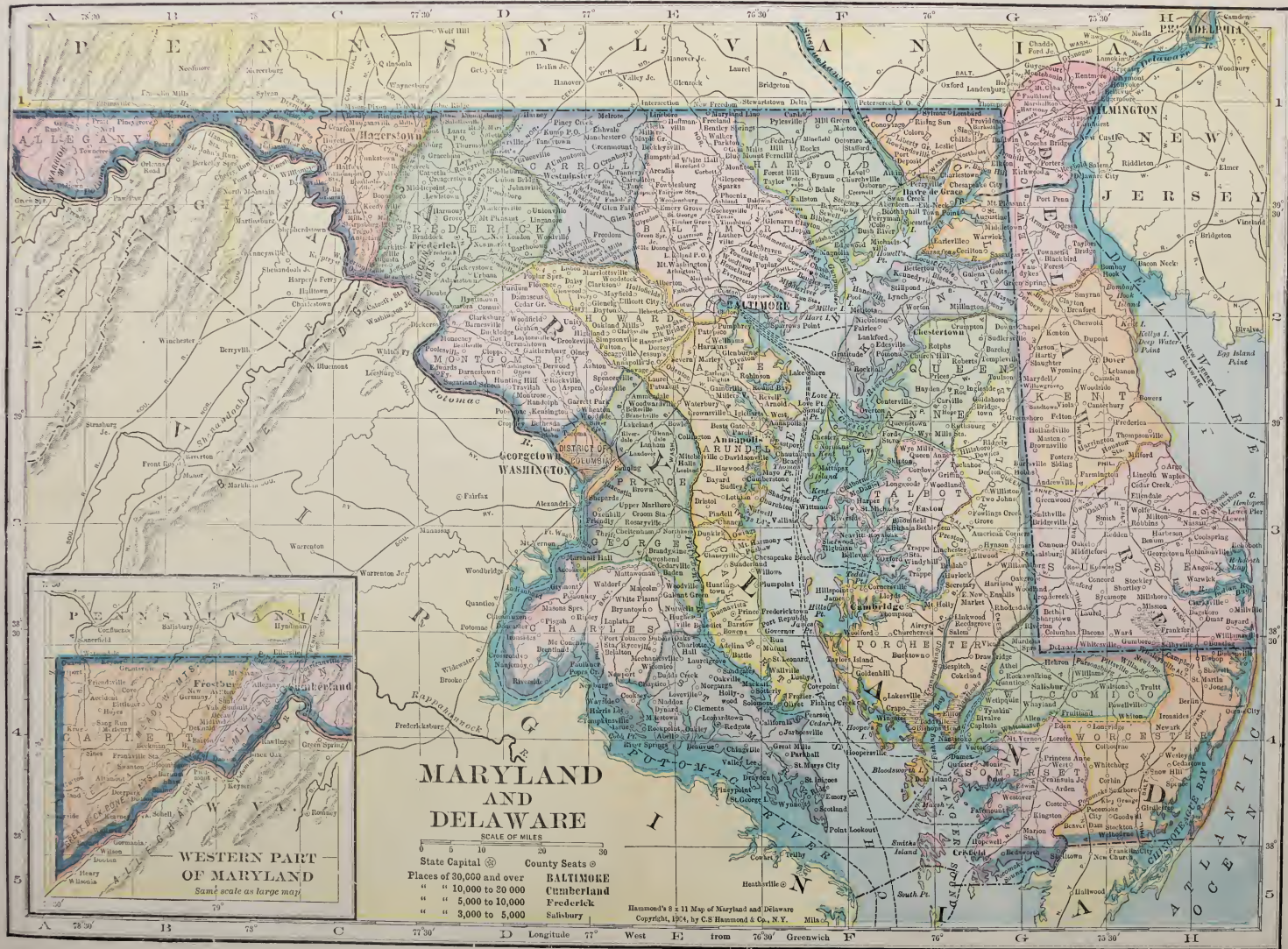
Industries.—The industries of Maryland are divided among agricultural, mining, manufacturing, fishing, and commercial. The number of farms in 1900 was 46,012; comprising 3,516,352 acres of improved and 1,653,723 acres of unimproved land. The value of the land and buildings was \$175,178,310, of the implements and machinery \$8,611,220, and of the live stock \$20,855,877, making a total of \$204,645,407. Among agricultural products were wool, 500,000 lbs.; potatoes, 1,995,910 bushels; hay, 366,000 tons; wheat, 15,187,848 bushels. The output of coal in 1901 was 4,565,292 tons, and of pig iron, 303,186 tons. The oyster beds of the Chesapeake include an area of nearly 250 square miles, and furnish 12,000,000 bushels a year, the industry giving employment to about 35,000 persons and 7,000 boats. Menhaden, mackerel and other fisheries are profitably conducted, and the raising and catching of terrapin and gunning for wild ducks are important industries. The manufactures of Maryland in 1900 included 9,879 establishments, with \$163,147,260 capital, giving employment to 108,325 hands, paying \$3,748,551 in wages, using material worth \$144,397,680, and yielding an output of \$242,552,900.

Finance and Commerce.—Baltimore, the metropolis of Maryland, ranks among the great financial and commercial centres of the United States. Loans and discounts of 19 national banks in Baltimore in 1903 were \$47,222,814, and in 68 country banks of Maryland, \$19,572,061. Baltimore clearing house exchanges were \$1,169,531,519, or the eighth largest in the country. Savings banks in the State had 155,299 depositors and deposits aggregating \$62,253,508. The commerce of Baltimore is very large. In 1900 imports were \$19,045,297, and exports \$115,470,766. Among the exports were cotton, \$8,001,051; corn, \$18,189,623 (the largest amount from any United States port); oats, \$1,354,774; rye, \$150,710; wheat, \$5,452,979 (exports of wheat vary much according to the crop); in 1898 Baltimore exported \$21,445,974 worth; wheat flour, \$11,388,582 (the second largest amount from any port); lard, \$7,914,492; bacon, \$3,185,927; illuminating oil, \$2,819,474; cattle, \$1,838,850; leaf tobacco, \$6,547,573. The tonnage of vessels entered at Baltimore in 1900 was 1,677,385, making it the fourth port of the United States in tonnage. The railroad mileage of the State in 1902 was 1,369.

Education.—Maryland maintains a high standard of public and private education. In 1900 the school population was 336,230, the enrollment in common schools was 224,004, and the average attendance for the school year of 190 days was 135,515. There were 5,036 teachers, who, with the superintendents, received \$2,044,144 in salaries. The 49 public high schools had 197 teachers and 4,508 pupils, and the 46 private high schools 262 teachers and 2,149 pupils. The State normal school had 12 teachers and 385 students; the 11 colleges and universities 241 instructors and 1,805 students; one technical institute 71 instructors and 333 students; five women's colleges 104 instructors and 1,080 students; six theological seminaries 57 instructors and 461 students; three law schools 37 instructors and 329 students; and eight medical colleges 226 instructors and 1,685 students.

Government.—Maryland is divided into twenty-three counties. The political capital is Annapolis. The chief State officers are a Governor, Secretary of State, Attorney General, and Superintendent of Education, elected for four years each; a Comptroller and a Treasurer, two years each; and a Chief Judge, 15 years. The bi-cameral Legislature meets annually.

History.—The colony of Maryland was founded by the English in 1634. George Calvert, the first Baron of Baltimore, first established a colony in Newfoundland, but abandoned that country because of the cold climate and sterile soil. He then got from Charles I. a charter and



grant of territory for a colony north of the Potomac River, but died before he could actually establish his enterprise. The work was, however, continued by his son, Cecil Calvert, who became the Proprietor or Proprietary of the colony, with autocratic powers. The English settlers were permitted to make their own laws, which however had to be approved by the Proprietary, and in that work they and he were entirely independent of the English Parliament. The right to tax the colony, even, was specifically renounced by the King, for himself and for his successors forever. Maryland thus enjoyed a greater degree of autonomy than any other American colony, and in return it granted to its inhabitants a marked freedom, especially in religious affairs. Cecil Calvert was a Roman Catholic, and his successors for two generations remained in that faith. But the Toleration Act of 1649, approved by him, guaranteed liberty of conscience and of worship to all Christians, Puritans as well as Catholics; but there was no toleration for Unitarians or any who denied the divinity of Jesus Christ. Charles Calvert, fifth Lord Baltimore, in 1716, became a Protestant, but the liberal policy of the colony was not changed. Maryland took a prominent and honorable part in the Revolution, and in the War of 1812. In the latter it suffered much from British invasion, and it had the distinction of being the scene, during the bombardment of Fort McHenry in 1814, of the writing of the American national anthem, "The Star Spangled Banner." At the outbreak of the Civil War in 1861 Maryland, a Slave State, was much divided in sentiment between the North and South. The first bloodshed of the war occurred in Baltimore on April 19, 1861, when a Massachusetts regiment was attacked by a Secessionist mob in Baltimore. The State remained in the Union, however, and sent many soldiers to the Union army. The only important battle fought in Maryland was that of Sharpsburg, or Antietam, but the State was more than once invaded by the Southern armies, notably by Lee in his march to Pennsylvania. The industries and commerce of the State were much disturbed by the Civil War, but were soon afterward restored to great prosperity.

Population.—The population of Maryland at decennial periods has been as follows:

Year.	White.	Colored.	Total.
1790	208,649	111,079	319,728
1800	216,326	125,222	341,548
1810	235,117	145,429	380,546
1820	260,223	147,127	407,350
1830	291,108	155,932	447,040
1840	318,204	151,815	470,019
1850	417,493	165,091	583,034
1860	515,918	171,131	687,049
1870	605,503	175,391	780,894
1880	724,713	210,230	934,943
1890	826,733	215,657	1,042,390
1900	952,980	235,064	1,188,044

The rank of Maryland in population among the States of the Union at the decennial years above given was respectively and successively 6, 7, 8, 10, 11, 15, 17, 19, 20, 23, 27, and 26. The population to the square mile was 32.2 in 1790, and has steadily and equably increased until in 1900 it was 120.5, when it ranked among the most densely populated States.

The only city of Maryland having more than 25,000 population is Baltimore. Its population was 332,313 in 1880, 434,439 in 1890, and 508,597 in 1900. In each of those years it was the sixth city of the Union in population. On Feb. 7, 1904, Baltimore was swept by one of the most devastating fires known to history. The total loss was estimated at about one hundred million dollars. A large portion of the business part of the city was laid in ashes.

W. FLETCHER JOHNSON.

MARYPORT, a market and seaport town of Cumberland, England, is situated on the Irish Sea, twenty-nine miles southwest from Carlisle. Population, 9,000.

MARYVILLE, a Missouri town, in Nodaway county, of which it is the capital, lies on the Kansas City, St. Joseph and Council Bluffs Railroad, forty-five miles from St. Joseph. It has banks, telegraphs, churches, schools, newspapers, flouring and saw mills, and considerable trade with the surrounding country. Population (1900), 4,577.

MARYSVILLE, a handsome little California town, the capital of Yuba county, lies on the Feather river, near its junction with the Yuba. It has considerable trade and varied manufactures, together with ample railroad, banking, and telegraph facilities. The town has several newspapers, numerous churches, and exceptionally good educational advantages. Gold is mined in the surrounding country. A line of steamers connects the city of Sacramento with Marysville. Population of Marysville (1900), 3,497.

MASACCIO. Tommaso Guidi, an Italian painter, was born in 1402, and is said to have studied under his contemporary, Masolino da Panicale. In 1421, or perhaps 1423, he was enrolled in the guild of the speciali (druggists) in Florence; in 1425, in the guild of painters. His first attempts in painting were made in Florence, and then in Pisa. Next he went to Rome, where he became prominent. In 1427 Masaccio was living in Florence with his mother, then for the second time a widow, and with his younger brother Giovanni, a painter of no distinction; he possessed nothing but debts. In 1428 he was working in the Brancacci chapel. Before the end of that year he disappeared from Florence, going, as it would appear, to Rome, to evade the importunities of creditors. Immediately afterward, in 1429, when his age was twenty-seven, he was reported dead. Poisoning by jealous rivals in art was rumored, but of this nothing is known.

MASANIELLO (an abbreviation of TOMMASO ANIELLO or ANELLO) was the leader of the Neapolitan revolt in July, 1647. For many years the Spanish Government had exacted large sums from the Two Sicilies, although the privileges granted by Ferdinand and Charles V. had exempted them both from taxes. Under Philip III. and Philip IV., the exactions, heavy in themselves, were made more oppressive by being farmed out to contractors, while the sums raised were usually conveyed to Spain and spent on purposes often having no connection with Naples. Meantime the industrial classes were scourged by the excesses of the nobility and the lawlessness of banditti. At the end of 1646, the duke of Arcos demanded a million ducats in gold; and it was resolved after much opposition to raise it from fruit, one of the most important articles of food to a southern people. Petitions delayed but did not remove the tax; on June 6th a toll-house was blown up, but the viceroy did not give way. The discontent was fomented by Genovino, who had been chosen "elect of the people." He selected for his purpose Masaniello, a fisherman of Naples, then twenty-seven years old, well built, intelligent, and very popular in the city. On July 16th, the feast of S. Maria del Carmine, it was customary to make a sort of castle which was defended by one body of youths armed with sticks and stormed by another. Masaniello had been chosen captain of one of these parties, and got together four hundred young men, with whom he had already raised the cry of "Down with the taxes" when the crisis was precipitated by a quarrel. On Sunday, the 7th, a dispute arose in the market (on which Masaniello's house looked), whether the gardeners or the buyers of their fruit should pay the tax. Finally the owner of the fruit (said to have been a kinsman of Masaniello) upset his basket, saying he would sooner let the people have it for nothing than pay the tax. Masaniello came up; the tax-collectors were pelted with fruit and then with stones, and the toll-house was burned with cries of "The king of Spain and plenty; down with misgovernment and taxes." The viceroy attempted to quiet the people by promises; his carriage was surrounded, and he escaped with difficulty to St. Elmo. Meanwhile the populace broke open the prisons, an

released all charged with offenses against the customs. In the evening, by advice of Genovino, a meeting elected officers, and decided on their demands. Masaniello was chosen captain, with one Perrone as his lieutenant.

The cardinal archbishop Filomarino did his best to mediate between the parties all through. The seizure of arms went on, and Masaniello, marching out of the city, disarmed and took prisoners 400 soldiers, while another body of people did the same with 600 German mercenaries. The castle being short of provisions, Masaniello sent some as a present to the viceroy. The Neapolitan galleys, under Gianettino Doria, arrived the same day, and Masaniello refused permission to land or to come nearer than a mile to the shore, but sent provisions on board. In fact he was now undisputed master of the city, not only organizing the military force in it with surprising ability, but dispensing strict though severe justice. Often he sat inside his little house on the market, sword or loaded gun in hand, while petitions and complaints were handed to him on the end of a pike through the window; yet he still went barefoot, dressed as a simple fisherman. The people having assembled consulted together on the terms of agreement; it was settled by the advice of Genovino that Masaniello should show the articles agreed on to the duke at the palace, and that the viceroy should afterward swear to them in the cathedral. Toward evening the procession set out, Masaniello in a dress of cloth of silver pressed upon him by the archbishop. An immense concourse of armed men, estimated at 140,000, lined the way or accompanied him. Before entering the palace he exhibited the charter brought by the archbishop, and charged them not to lay down their arms till they had received the confirmation of their rights from the king of Spain. "If I do not return in an hour," he added, "wreck the city." He was received by the viceroy as an equal. All the conditions were agreed to, the chief being that the elect of the people should have as many votes as the nobles; that all taxes should be removed except those already existing in Charles V.'s time; that the viceroy should set the articles ratified by the king within three months; that no punishment should be inflicted on those who had taken part in the rising; and that the people should keep their arms till the ratification. On the Friday Masaniello dismissed most of his followers to their work, keeping a patrol of four men and a corporal in each street. Next day the ceremony in the cathedral took place; the duke of Canjano read the articles, Masaniello meanwhile correcting and explaining, and the viceroy solemnly swore to observe them. Then Masaniello tore off his rich dress; it was time, he said, to return to his fish. And indeed from this time began his ruin. For a week the care of a city, with hundreds of thousands of inhabitants, had rested upon him; he had been general, judge, legislator, and during the whole time he had hardly slept or eaten, the latter through dread of poison; no wonder if the fisherman's brain reeled under all this. His justice had been severe, but hitherto it had struck men who deserved punishment, the oppressor, the robber, the hired cut-throat; henceforth everyone who ventured to contradict him risked his life, and the only man who could persuade him to mercy was the good archbishop. Five hundred in all, it is said, were put to death by his order; though it is probable that they were few compared to the lives taken a short time afterward by the viceroy in defiance of his plighted word.

On Tuesday, the 16th, the feast of S. Maria del Carmine, Masaniello went up into the pulpit, and in a wild harangue recapitulated his services. He knew, he said, his death was near at hand; then tearing open his dress

he showed his body emaciated by fatigue and want of food. After some more wild talk he was disarmed and confined in a monastery. There the quiet seems to have restored him; but his assassins soon broke in; he turned to meet them; five shots were at once fired, and he fell dead. His head was cut off and carried through the streets, while his body was dragged about the city for awhile and then buried outside the city.

MASAYA, a town in Nicaragua, Central America, on the east side of the Lake of Masaya, about fifty-five miles southeast of Managua, and twenty-five miles northwest of Granada. The population, mostly of Indian blood, was in 1900, 20,000.

MASCARA, a fortified town of Algeria, in the province of Oran, sixty miles southeast of Oran, lies at a height of 1,900 feet above the sea, on the southern slope of the first chain of the Atlas mountains, and occupies two small hills separated by the Oued Toudman. Population, 10,000.

MASCARENE ISLANDS, or MASCARENHAS, a group in the Indian Ocean to the east of Madagascar, consisting of Mauritius (Île de France), Réunion (Bourbon), and Rodriguez. Mauritius and Rodriguez belong to Great Britain, Réunion to France. The collective title is derived from the Portuguese navigator, Garcia Mascarenhas, by whom Bourbon, at first called Mascarenhas, was discovered in 1505.

MASCARON, JULES, French pulpit orator, was born at Marseilles in 1634, and died at his diocesan city of Agen in 1703.

MASCHERONI, LORENZO, an Italian geometer, was professor of mathematics at the university of Pavia, and published a variety of mathematical works. He was born in 1750 and died in 1800.

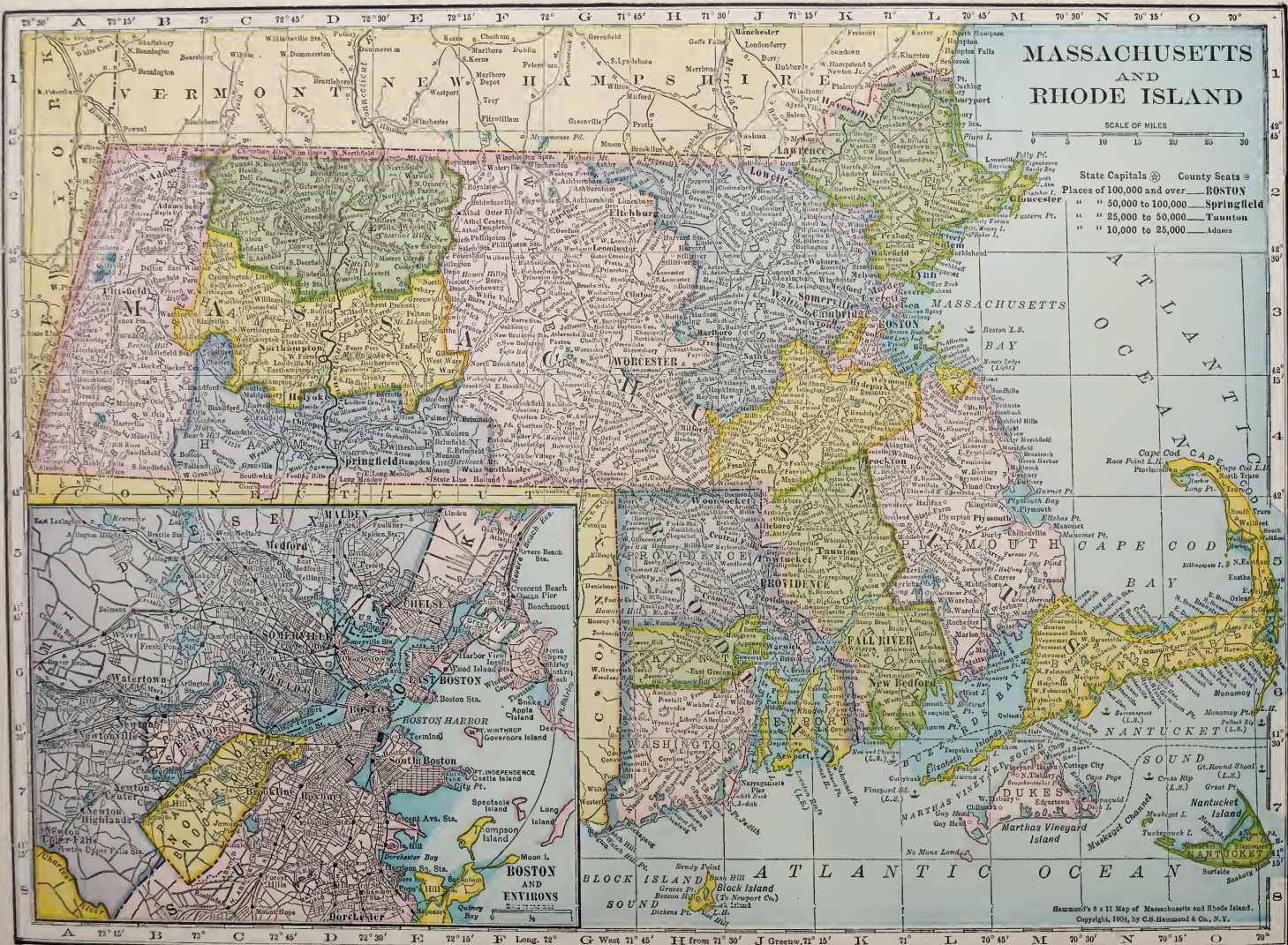
MASINISSA, a Numidian prince whose history is closely intertwined with that of the wars between Rome and Carthage. With true barbarian fickleness, and a keen eye to his own interests, he espoused now one side, now the other, inclining however on the whole decidedly in favor of Rome, so much so indeed as to be spoken of by Roman orators and historians as "a most faithful ally of the Roman people." He was the son of a Numidian king or chief, Gala, whose dominions coincided with the eastern portions of Numidia, and thus bordered on Carthaginian territory, or what is now Tunis.

MASK, or MASQUE. See DRAMA.

MASKELYNE, NEVIL, astronomer-royal at Greenwich for nearly half a century, was born in London October 6, 1732. The great solar eclipse of 1748 seems to have made a deep impression upon him; and after studying divinity at Trinity College, Cambridge, of which he was elected a fellow in 1756, he determined to devote himself wholly to astronomy. He early became intimate with Bradley, and in 1761 was deputed by the Royal Society to make observations of the transit of Venus at St. Helena. During the voyage he introduced into navigation the determination of longitude by lunar distances, a method which Mayer's recently published tables had made practically possible. In 1763 he undertook a voyage to Barbados to test Harrison's watches, which, however, he reported to be inferior to the method of lunars for determining longitude. In 1765 he succeeded Bliss as astronomer-royal, and thereafter devoted himself with singular energy to the duties of his office, which he held till his death, February 9, 1811.

MASKINONGE. See PIKE.

MASOLINO DA PANICALE. Masolino was said to have been born at Panicale di Valdelsar, near Florence, or more probably in Florence itself, in 1383; his death took place later than 1429, perhaps as late as



1440. The only works which can with certainty be assigned to him are a series of wall paintings executed toward 1428, commissioned by Cardinal Branda Castiglione, in the church of Castiglione d'Olonia, not far from Milan, and another series in the adjoining baptistery.

MASON, FRANCIS, an American missionary, son of a shoemaker in York, England, was born April 2, 1799. He died at Ranyon, March 3, 1874.

MASON, GEORGE HEMMING, painter, A.R.A., was born at Whitley, England, in 1818, the eldest son of a Staffordshire county gentleman. After Mason's return from the Continent, in 1858, when he settled at Wetley Abbey, he continued to paint Italian subjects from studies made during his foreign tour, and then his art began to touch, in a wonderfully tender and poetic way, the peasant life of his native England, and especially of his native Staffordshire, and the homely landscape in the midst of which that life was set. Mason long suffered from heart disease, which carried him off on October 22, 1872.

MASON, WILLIAM, was about the beginning of the last quarter of the eighteenth century one of the most eminent of living poets, but his eminence was owing to the lowness of the poetic level at the time. He is now held in remembrance, not by his poetry, but by his having been the friend, the literary executor, and the biographer of Gray. Born in 1725, the son of a Yorkshire clergyman, entered of St. John's College, Cambridge, in 1742, he took his bachelor's degree in 1745, and seems to have at once decided steadily on a literary career, reading little or nothing, Gray says, but writing abundance. Mason took orders in 1754, and soon afterward was presented to the Vicarage of Ashton, in Yorkshire, the canonry of York, the prebend of Driffield, and the precentorship of York cathedral. Ashton was his residence till his death, in 1797.

MASON AND DIXON'S LINE, a line in the United States between Pennsylvania on the north and Delaware, Maryland, and West Virginia on the south, famous for a long time as the limit between the "free" and the "slave" States. It derives its name from Charles Mason, F.R.S. (1730-87), and Jeremiah Dixon, two English astronomers who, between 1763 and 1767, surveyed the line for 244 miles west from the Delaware river, leaving only thirty-six miles of the Pennsylvania boundary to be fixed in 1782-84. This line must not be confounded, as has often been done, with the parallel of 36° 30' N. latitude, which was assigned by the "Missouri compromise" of 1820 as the limit to the north of which slavery could not be introduced.

MASS. See EUCHARIST and MISSAL.

MASSA, or, to distinguish it from several places of the same name, MASSA CARRARA, a city of Italy, the chief town of the province of Massa, lies on the left bank of the Frigido, a small stream falling into the Gulf of Genoa about three miles lower down. Pop., 18,000.

*MASSACHUSETTS, an Indian word meaning "Great Hills," is the name of the central and most populous New England State, one of the foremost of the original thirteen, and the seventh in population at the present time.

Description.—The State of Massachusetts is bounded on the north by New Hampshire and Vermont, on the east by the Atlantic Ocean, on the south by Rhode Island and Connecticut, and on the west by New York. The lines between it and the other States are arbitrary, save that the New York line follows largely the Taconic Mountain range. The State comprises the two large

islands of Martha's Vineyard and Nantucket, and several smaller ones in the Atlantic Ocean. It extends from 41° 15' to 42° 53' north latitude, and from 69° 52' to 73° 32' longitude west from Greenwich. Its area is 8,040 square miles of land and 275 of water. Its outline is irregular, and is marked with the long curved projection into the Atlantic Ocean known as Cape Cod. The surface of the land is much variegated, presenting almost every aspect from coast marshes to rugged mountains. The eastern part along the coast, is mostly low and level, though it is relieved by some considerable elevations, such as those which, visible from the sea, gave it the Indian name of "Great Hills." This part of the State also contains numerous lakes and rivers, and offers a considerable area of fertile land. The central portion of the State is a superb rolling upland, of great attractiveness to the eye, abundantly watered by lakes and rivers, and containing much good farming land. The western part, extending from the Connecticut River to the crest of the Taconic Mountains, is one of the most picturesque regions in America, consisting of range after range of hills, with broad and fertile valleys intermingled and with innumerable streams and lakes to add charm to the prospect. The climate is generally cold in winter, but delightful in summer, though its liability to sudden changes of temperature makes it trying especially to those with delicate lungs and throats. The rainfall is of normal amount. The land is largely underlaid with granite, syenite, limestone, sandstone and marble, but there are a few other minerals of importance.

Resources and Products.—The mineral resources of Massachusetts are found chiefly in quarries of granite and marble, which are of great extent and value. In early years Massachusetts ranked high as an agricultural State. For the last half century it has advanced but little in that respect, and has been far outstripped by others, partly because of its comparatively small area of good land and partly because it has been found more profitable to engage in manufacturing and other industries. Nevertheless Massachusetts still has considerable agricultural industries. In 1900 there were 37,715 farms, containing 1,292,132 acres of improved and 1,854,392 of unimproved land. The value of land and buildings was \$158,019,290, of implements and machinery \$8,828,950, and of live stock \$15,798,464. The total agricultural value was \$182,646,704, which was more than that of Alabama, Arkansas, Colorado, South Carolina or Oregon, and nearly as much as that of Louisiana or Mississippi—distinctively agricultural States. The agricultural products are varied, comprising all grains, hay, potatoes, tobacco, vegetables and fruit. The dairy and poultry interests are very large. Massachusetts is however, distinctively a manufacturing State, in that respect easily outranking all others except New York, Pennsylvania and, possibly, Illinois. In 1890 it contained 29,180 manufacturing establishments, with \$823,264,287 capital, paying \$228,240,442 in wages to 497,448 employes, using \$552,717,955 worth of material, and producing a finished output of \$1,035,198,989. The manufactures include almost every conceivable variety of goods, cotton and woolen textiles, boots and shoes, and

steel and iron wares being the foremost. Although small in area, Massachusetts contains more than 2,112 miles of railroads.

Finance and Commerce.—Massachusetts is one of the foremost financial States of the Union. In 1902 loans and discounts of 34 Boston banks amounted to \$165,895,018, a larger amount than those of any other city save New York and Chicago. Loans and discounts of 207 other banks in the State were \$119,946,233. The savings banks had 1,593,640 depositors and \$560,705,752 in deposits, vastly exceeding those of any other State except New York. The exchanges of the Boston clearing house were the largest after New York and Chicago, being \$6,912,674,641, while those of Fall River were \$51,158,383; of Lowell, \$29,061,082; of New Bedford, \$27,117,644; of Springfield, \$80,780,012; of Worcester, \$84,812,149; and of Holyoke, \$19,941,461. Commercially, too, Massachusetts excels all States except New York. In 1902 vessels entered at the port of Boston aggregated 2,411,230 tons, or much more than at any port except New York. Imports at Boston were \$71,921,436, and exports, \$102,404,304. There is also a considerable foreign trade from other ports, such as New Bedford, Fall River, and Gloucester.

Education.—In educational matters Massachusetts has always stood in the foremost rank of American States. It contains Harvard University, the oldest and largest institution of higher learning in the Union, and there are a dozen other universities and colleges of the best character. The public school system is one of the best in the world. In 1900 the school population of the State was 623,211, the enrollment in common schools was 474,891, and the average attendance during the school year of 189 days was 366,136. There were 13,575 teachers, who, with the superintendents, received salaries amounting to \$13,826,243, the fourth largest amount thus paid by any State. The public high schools numbered 241, with 1,617 teachers and 38,314 students, and the private high schools, 96 in number, had 679 teachers and 5,935 students. Public normal schools were ten, with 127 teachers and 1,888 students, and private normal schools three, with 27 teachers and 207 students. The Universities and colleges had 504 instructors and 5,573 students; the institutes of technology conferring degrees had 235 instructors and 1,745 students; colleges for women, conferring degrees, had 338 instructors and 2,934 students; theological seminaries, 77 instructors and 496 students; law schools, 60 instructors and 1,226 students; and medical colleges, 165 instructors and 1,138 students.

Government.—The capital of Massachusetts is Boston, and the State is divided into fourteen counties. The chief State officers are a Governor, Lieutenant-Governor, Secretary of the Commonwealth, Attorney-General, Auditor, and Treasurer, elected for one year each; and a Chief Justice, elected for life. The Governor is officially styled His Excellency, and the Lieutenant-Governor is called His Honor. There is also a Governor's Council, consisting of eight members, elected by districts. The legislature, consisting of two Houses, meets annually. Cities, which are largely self-governing,

must have at least 12,000 population. Smaller communities are incorporated as towns, and also are autonomous. Each town is governed by a board of selectmen, chosen at a yearly town meeting. Indeed the principle of local self-government, which was established in the colony of Massachusetts in its earliest times, is perhaps better perfected in that State than in any other. It was the town meeting system of Massachusetts which perhaps more than anything else prepared the people for independence of Great Britain and encouraged them to seek it.

History.—The history of Massachusetts is in an exceptional degree the history of the United States. Probably no other one State has so largely influenced the career of the whole Union, or contributed, politically, intellectually and morally, so much to its growth. Its origin dates from the Plymouth Company, of England, which in 1606 sent out its first ship. This was captured by the Spaniards before any settlement was made. The next year another ship, with a hundred people, was sent, to establish a colony at the mouth of the Kennebec River, in Maine. That enterprise was a failure, all the colonists returning to England, and for several years no further attempts were made. In 1614 Captain John Smith, in the service of that company, explored the coast from the Penobscot River to Cape Cod and drew a map of it. The name New England was then given to that territory, and in 1615 Smith attempted to plant a colony upon the coast. It also failed, because the colonists could not endure the harsh climate. Being seekers after wealth and pleasure, they preferred the softer airs of the south. The "stern and rock-bound coast" of Massachusetts was thus reserved for a more resolute company, fired with some greater zeal than the "auri sacra fames." Such were the Pilgrims, who came to America in quest of "freedom to worship God" according to the dictates of their own consciences. They indeed meant to land further south, but missed their reckoning and after a long and stormy voyage arrived in their little ship, the *Mayflower*, at Cape Cod on December 9, 1620. After some little exploration of the coast they made their landing at Plymouth, Massachusetts, on December 22, 1620. Upon the basis of a constitution and compact signed aboard ship before landing they established a civil government, with John Carver as President or Governor, and Miles Standish as Commander in Chief of their military forces. The little colony endured dreadful privations, sufferings and losses in its early years, but bravely held its ground. Soon after other colonists made their way to the same coast. In 1628 John Endicott and three hundred others came over and founded at Salem a colony called Massachusetts, which the next year was incorporated under the title of "The Governor and Company of Massachusetts Bay in New England." In 1630 about 1,500 colonists came over, including Governor Winthrop, who brought the charter and many other men of rank and substance. The city of Boston was then founded, and in the fall of 1630 was made the chief town of the colony, and its political capital. The other individual towns always retained, however, a large measure of self-government, and that system, with its characteristic "town meetings," must be credited with the admirable civic spirit which arose in New England and made it the chief scene of the rise of American independence and republicanism. In the early years of Massachusetts the government was largely ecclesiastical, and there was much intolerance toward people of other faith than that of the established church. Episcopalians, Baptists and Quakers especially were under the ban, and were imprisoned or exiled. The reason of this was that the colonists had come thither for freedom to worship God in their own way, and they did not mean to let their old oppressors of the episcopacy, or any other religionists, get a footing there to disturb them. There were also many troubles with the Indians, and several desperate wars. Meantime the intellectual development of the Colony waxed apace, far in advance of any other colony. Harvard College was founded in 1638, and in 1639 the first printing press in North America was there set up.

Massachusetts was one of the first colonies to clash with the English Government, when the Stuart Kings attempted to repress its liberties. In 1684 the charter of the colony was arbitrarily annulled and Sir Edmund Andros was appointed Governor with dictatorial powers. In 1689 the people revolted against his odious tyranny, and defied the English Government until 1692, when William III. granted them a new charter. The seeds of revolution and independence, however, had been planted too surely to be easily destroyed. The colony thereafter maintained a critical disposition toward the mother country. Its people fought bravely for England in more than one war against the French, but at the same time were cherishing the design of one day fighting for themselves. When the fatuous policy of George III. and his Ministers drove America to revolt, Massachusetts was foremost in raising the standard of Independence. The first serious engagements of the war occurred at Lexington, Concord and Bunker Hill. Thereafter the history of Massachusetts became an integral and conspicuous part of the history of the United States, to which the reader is referred.

Population.—The population of Massachusetts at decennial periods has been as follows:

Year.	White.	Colored.	Total.
1790	373,324	5,463	378,787
1800	416,393	6,452	422,845
1810	465,303	6,737	472,040
1820	516,419	6,740	523,159
1830	603,359	7,049	610,408
1840	729,030	8,669	737,699
1850	985,450	9,064	994,514
1860	1,221,464	9,602	1,231,066
1870	1,443,404	13,947	1,457,351
1880	1,764,383	18,697	1,783,085
1890	2,216,799	22,144	2,238,943
1900	2,773,372	31,974	2,805,346

In 1790 Massachusetts ranked fourth in population; in 1800 and 1810, fifth; in 1820, seventh; in 1830 and 1840, eighth; in 1850, sixth; in 1860, 1870 and 1880, seventh; in 1890, sixth; and in 1900, seventh. The population to the square mile, averaged in 1790, 47.1; in 1800, 52.6; in 1810, 58.7; in 1820, 65.1; in 1830, 75.9; in 1840, 91.8; in 1850, 123.7; in 1860, 153.1; in 1870, 181.3; in 1880, 221.8; in 1890, 278.5; and in 1900, 348.9. The last figures are exceeded by only those for the State of Rhode Island and the District of Columbia. The native and foreign born populations have been as follows according to the last three censuses:

	1880.	1890.	1900.
Native	1,339,594	1,581,810	1,959,022
Foreign	443,491	657,137	846,324

The cities of Massachusetts above 25,000 population, with their rank (in parentheses) among the cities of the United States and population at the last three censuses, are as follows:

	1880.	1890.	1900.
Boston.....	(4) 362,839	(5) 448,477	(5) 560,892
Worcester....	(27) 58,291	(31) 84,655	(29) 118,421
Fall River....	(36) 48,961	(39) 74,398	(33) 104,863
Lowell	(26) 59,475	(36) 74,398	(39) 94,969
Cambridge....	(30) 52,669	(40) 70,028	(41) 91,886
Lawrence....	(45) 39,151	(63) 44,645	(57) 62,559
New Bedford..	(74) 26,845	(71) 40,733	(58) 62,442
Springfield...	(54) 33,340	(64) 44,179	(60) 62,059
Somerville....	(77) 24,933	(73) 40,152	(61) 61,643
Holyoke.....	(84) 21,915	(84) 35,637	(82) 45,712
Brockton.....	(123) 13,608	(112) 27,294	(92) 40,063
Haverhill....	(102) 18,472	(111) 27,412	(104) 37,175
Salem	(71) 27,563	(99) 30,801	(110) 35,956
Chelsea.....	(87) 21,782	(106) 27,909	(117) 34,972
Malden.....	(131) 12,017	(131) 23,031	(120) 33,664
Newton.....	(108) 16,995	(127) 24,379	(122) 33,587
Fitchburg....	(129) 12,429	(134) 22,037	(128) 31,531
Taunton.....	(89) 21,213	(120) 25,448	(131) 31,036
Gloucester....	(98) 19,329	(125) 24,651	(153) 26,121

W. FLETCHER JOHNSON.

MASSÉNA, ANDRÉ, duke de Rivoli, prince of Essling, and marshal of France, the greatest soldier and greatest general of all Napoleon's marshals, and the one man who with education and ambition might have been Napoleon's rival, was the son of a wine merchant, it is said of Jewish origin, and was born at Nice, on May 6, 1758. His parents were very poor, and he began life as a cabin boy. He did not care much for the sea, and in 1775 enlisted in the Regiment Royal Italien, a regiment of Italians in the pay of France. He quickly rose to be under-officer-adjutant; but, finding his birth would prevent his ever getting a commission, he left the army in 1789, retired to his native city, and married. At the sound of war, however, and the word republic, his desire to see service increased, and he once more left Italy, and joined the third battalion of the volunteers of the Var in 1792. By April, 1793, Masséna was chef de battalion, or colonel. In command of the advanced guard he won the battle of Saorgio in August, 1794, capturing ninety guns, and after many successes he at last, on November 23, 1795, with the right wing of the army of Italy, won the great victory of Loano, in which four thousand Austrians and Sardinians were put *hors de combat*. In Bonaparte's great campaign of 1796 and 1797 Masséna was his most trusted general of division; in each battle he won fresh laurels, until the crowning victory of Rivoli, from which he afterward took his title. It was during this campaign that Bonaparte gave him the title of *enfant chéri de la victoire*, which he was to justify till he met the English in 1810. Masséna's next important service was in command of the army in Switzerland, which united the army in Germany under Moreau, and that in Italy under Joubert. There he proved himself a great general; the archduke Charles and Suwaroff had each been successful in Germany and in Italy, and now turned upon Masséna in Switzerland. That general held his ground well against the archduke, and then suddenly, leaving Soult to face the Austrians, he transported his army to Zürich, where, on September 26, 1799, he entirely defeated Suwaroff, taking 200 guns, and 5,000 prisoners. His campaign and battle placed his reputation on a level with that of his compatriot Bonaparte, and he might have made the revolution of Brumaire, but he was sincerely attached to the republic, and had no ambition beyond a desire to live well and have plenty of money to spend. Bonaparte, now first consul, sent him to Genoa to command the débris of the army of Italy, and he nobly defended Genoa from February to June to the very last extremity, giving time for Bonaparte to strike his great blow at Marengo. He now went to Paris where he sat in the Corps Législatif, in 1803, and defended Moreau, but where Napoleon took his measure, and did not interfere with him. In 1804 he was made one of the first marshals of France of the new régime, and in 1805 was decorated with the Grand Eagle of the Legion of Honor.

After the peace of Pressburg had been signed, Masséna was ordered to take possession of the kingdom of Naples, and to place Joseph Bonaparte on the throne. This task done, Napoleon summoned Masséna to Poland, where he as usual distinguished himself, and where he for a time gave up his republican principles, and was made duke of Rivoli. In the campaign of 1809 he covered himself with glory at Landshut and at

Eckmühl, and finally at the little village of Essling, which he held with such determination that Napoleon had some right to call his otherwise complete defeat of Aspern a victory. When the retreat to the island of Lobau was ordered, it was Masséna who covered the broken regiments, and held the *tête du pont*; and on the field of Wagram it was Masséna who, though too ill to ride, directed from his carriage the movements of the right wing, and recovered the honor of France. For his great services he was created prince of Essling, and given the castle of Thourars. He was then ordered to Spain to "drive the English into the sea." Masséna himself ascribed his failure to the frequent disobedience of his three subordinate generals, Ney, Reynier, and Junot, and with some justice; but he alone could have stayed so long before the lines, and could have made the long halt at Santarem, which checked Wellington so thoroughly. The retreat was as finely conducted as the advance, and would have been even more triumphant had Ney obeyed orders. Even then he was again ready to try his fortune, and nearly defeated Wellington at Fuentes d'Oñoro, though much hampered by Bessières. Recalled with ignominy, his prestige gone, the old marshal felt he had a right to complain of Ney and of Napoleon himself, and, it is said, opened communications with Fouché and the remnant of the republican party. Whether this be true or not, Napoleon gave his greatest marshal no more employment in the field, but made him merely commandant of the eighth military division, with his headquarters at Marseilles. This command he still held at the restoration of the Bourbons, when Louis XVIII. confirmed him in it. When Napoleon returned from Elba, Masséna, probably by the advice of Fouché, kept Marseilles quiet to await events, the greatest service he could do the royalists, but afterward imputed to him as a fault. After the second restoration Masséna was summoned to sit on the court-martial which tried Marshal Ney, but, though he had been on bad terms with that general, and attributed his own disgrace to him, the old soldier would not be his comrade's judge. This refusal was used by the royalists to cruelly attack the marshal, against whom they raked up every offense they could think of, and whose victories they forgot. This annoyance shortened his life, and on April 4, 1817, the old hero died.

MASSILLON, a city of Stark county, Ohio, is situated on the Tuscarawas, a head stream of the Muskingum, communicates with Lake Erie by the Ohio canal, and forms an important junction for various lines of railway. It is well known for its coal-mines and white sandstone quarries; and it also contains blast-furnaces, rolling-mills, foundries, machine-shops, grist-mills, and extensive establishments for the manufacture of agricultural implements, glass, and paper. Pop. (1900), 11,944.

MASSILLON, JEAN BAPTISTE, was born at Hyères on June 24, 1663, and died at Clermont on September 28, 1742. He was thus, except Saint-Simon and Fontenelle, the longest-lived of the men of the Siècle de Louis Quatorze. It is noteworthy that, like the majority of the great pulpit orators of his own and the preceding generation, he was a southerner.

MASSINGER, PHILIP, one of the most prolific, scholarly, and powerful dramatists among the immediate successors of Shakespeare. He was born in 1584, went to Oxford (St. Alban's Hall) in 1602, and left in 1606. After 1621 many of his plays were acted and published; but from the tone of his dedications it is to be inferred that he was often in straits. The entry in the parish register of St. Savior's—"March 20, 1639-40—buried Philip Massinger, a stranger"—may mean only that Massinger was not a resident in the parish; but it

is sadly out of keeping with the dramatist's place in the respect of posterity.

MASSORAH, better MASSORETH, a late Hebrew word meaning "tradition," is the technical term specially applied to the tradition by which Jewish scholars sought to fix the correct writing and reading of the text of the Old Testament.

MASSOWAH, or MESOWAH, a town of the Abyssinian coast of the Red Sea, on a small coral island of the same name. The height of the island is from twenty to twenty-five feet above the sea, the length does not exceed one-half mile, and the breadth is about one-fourth of a mile. The western half is occupied by the town; in the eastern half are Mohammedan burying-grounds and dismantled cisterns. Population, 1899, 7,775.

MASSYS, or MATSYS, QUINTIN, was born in 1466 at Louvain, where he first learned a mechanical art. During the greater part of the fifteenth century the centers in which the painters of the Low Countries most congregated were Bruges, Ghent, and Brussels. Toward the close of the same period Louvain took a prominent part in giving employment to workmen of every craft. It was not till the opening of the sixteenth century that Antwerp usurped the lead which it afterward maintained against Bruges and Ghent, Brussels, Mechlin, and Louvain. Quintin Massys was one of the first men of any note who gave reputation to the guild of Antwerp. A legend still current relates how the smith of Louvain was induced by affection for the daughter of an artist to change his trade and acquire proficiency in painting. The date of his retirement from Louvain is 1491, when he became a master in the guild of painters at Antwerp. His most celebrated picture is that which he executed in 1508 for the joiners' company in the cathedral of his adopted city. Next in importance to that is the *Maries of Scripture round the Virgin and Child*, which was ordered for a chapel in the cathedral of Louvain. Both altar-pieces are now in public museums, one at Antwerp, the other at Brussels. He died in 1530.

MASTER AND SERVANT. These are scarcely to be considered as technical terms in law. The relationship which they imply is created when one man hires the labor of another for a term. Thus it is not constituted by merely contracting with another for the performance of a definite work, or by sending an article to an artificer to be repaired, or engaging a builder to construct a house. Nor would the employment of a man for one definite act of personal service—e.g., the engagement of a messenger for a single occasion—generally make the one master and the other servant.

MASTIC, or MASTICH, a resinous exudation obtained from the lentisk, *Pistacia Lentiscus*, an evergreen shrub of the natural order *Anacardiaceae*. The lentisk or mastic plant is indigenous to the Mediterranean coast region from Syria to Spain, but grows also in Portugal, Morocco, and the Canaries.

MASTODON, a name, suggested by the conical or papillary form of the projections on the molar teeth of some of the species, given by Cuvier to a genus of extinct elephant-like animals. Their position in the sub-order *Proboscidea* of the great order *Ungulata* has been indicated in the article MAMMALIA. In size, general form, and principal osteological characteristics the Mastodons resembled the Elephants. It is by the teeth alone that the two groups are to be distinguished. The range of the genus *Mastodon* in time was from the middle of the Miocene period to the end of the Pliocene in the Old World, when they became extinct; but in America several species—especially the best-known, owing to the abundance of its remains, which have been variously

called *M. ohioticus*, *M. americanus*, and *M. giganteus*—survived to quite a late Pleistocene period.

MAS'UDY. Abū'l-Hasan 'Alī ibn Hōsein ibn 'Alī el-Mas'ūdy, was born at Bagdad toward the close of the ninth Christian century. Great part of his life was spent in travel; in 912-13 A.D., he was at Mūltān in the Punjab, and also visited Mansūra. Three years later he was at Basra and met Abu Zeid, the geographer whose remarks on the extreme East are comprised in Reinaud's *Relation des Voyages*. His writings and those of Mas'ūdy are indebted each to the other. In the same year he composed the *Meadows of Gold*. The last ten years of his life were passed in Syria and Egypt. His last work, *The Indicator and Monitor*, was written 345 A.H., and his death took place in Egypt the same year, (956-57 A.D.)

MASULIPATAM, the chief town of Kistna district, Madras, India, and a seaport, with a population of 36,316.

MATAMOROS, a city of Mexico, in the province of Tamaulipas, on the southern bank of the Rio Grande, about thirty-five miles from its mouth, and directly opposite Brownsville in Texas. Built in an open plain, Matamoros has its streets laid out with great regularity; and the general appearance gives evidence at once of its recent rise into importance and of the influence of the architectural fashions of the United States. The principal building is the large but heavy-looking cathedral. An extensive traffic, both legitimate and contraband, is carried on between Matamoros and Brownsville, and in spite of the bar at the mouth of the river, which in foul weather prevents the entrance even of small schooners, the place is not without its value to Mexico as a foreign port. The imports of American and of European goods are valued each at about \$1,100,000, with a growing preponderance on the side of the American. Cotton, flax, silk, and woolen goods are the main items in the European list; cottons, leaf tobacco, wheat-flour, machinery, and preserved meats in the American. Hides and skins, live animals, and wool are the principal exports apart from coin and bullion, which are largely smuggled to avoid the export duty. The population is about 20,000.

MATANZAS, or SAN CARLOS DE MATANZAS, a city and seaport on the north coast of Cuba, and the chief town of a province, lies fifty-two miles east of Havana, with which it is connected by rail. It is a well-built place of from 36,000 to 40,000 inhabitants, occupying a fine site at the head of the Bay of Matanzas, and separated from its suburbs Pueblo Nuevo and Versailles by the San Juan on the one hand and the Yamurri on the other. Pop. (1000), 36,374.

MATARÓ, a Mediterranean seaport of Spain, in the province of Barcelona, twenty-one miles to the northeast of that city, is beautifully situated on the lower slopes and at the foot of the range of hills which skirt the coast and shelter the town from the cold, northern winds. The streets of the new town, lying next the sea, are wide and regularly built; those of the old town, farther up the hill, still preserve much of their ancient character. The population in 1900 was about 19,000.

MATCHES. Till the close of the eighteenth century flint and steel with tinder-box and sulphur-tipped splints of wood—"spunks" or matches—were the common means of obtaining fire for domestic and other purposes. The sparks struck off by the percussion of flint and steel were made to fall among the tinder, which consisted of carbonized fragments of cotton and linen; the entire mass of the tinder was set into a glow, developing sufficient heat to ignite the sulphur with which the matches were tipped, and thereby the splints themselves were set on fire. Instead of tinder, match-paper or

touch-paper, a thick, bibulous paper impregnated with saltpeter (nitrate of potash), and amadou or German tinder, a thick, leathery and porous preparation from the fungus *Polyporus fomentarius*, were often used.

It was not till 1805 that any attempt was made to use chemical agency for the ordinary production of fire. In that year M. Chancel, assistant to Professor Thenard of Paris, introduced an apparatus consisting of a small bottle containing asbestos, saturated with strong sulphuric acid, with splints or matches coated with sulphur and tipped with a mixture of chlorate of potash and sugar. The matches so prepared, when brought into contact with the sulphuric acid in the bottle, ignited, and thus, by chemical action, fire was produced. It appears also that in the same year phosphorus matches were known in Paris, and in 1809 Dérépas proposed to lessen the dangerously great inflammability of the phosphorus match by making an igniting mixture of that element with magnesia. It is also said that M. Derosne made a friction match with a phosphorus tip in 1816.

The first really practical friction matches were made in England in 1827, by Mr. John Walker, a druggist of Stockton-on-Tees. These were known as "Congreves," after Sir William Congreve, Bart., the inventor of the Congreve rocket, and consisted of wooden splints or sticks of cardboard coated with sulphur and tipped with a mixture of sulphide of antimony, chlorate of potash and gum. The phosphorus friction match of the present day was first introduced on a commercial scale in 1833; and it appears to have been made almost simultaneously in several distinct centers. Improvements in the manufacture have been numerous; and the industry is now carried on with a complete system of ingenious labor-saving machinery. The use of phosphorus as a principal ingredient in the igniting mixture of matches has not been free from very serious disadvantages. It is a deadly poison, the free dissemination of which has led to many accidental deaths, and also to numerous cases of willful poisoning and suicides. Workers also who are exposed to phosphoric vapors are subject to a peculiarly distressing disease which attacks the jaw, and ultimately produces necrosis of the jawbone; it appears, however, that, with scrupulous attention to ventilation and cleanliness, almost all risk of the disease may be avoided. Strenuous efforts have been made by numerous inventors to introduce matches having no phosphorus in their igniting mixture, but hitherto with indifferent success. The most serious objections to the use of phosphorus have, however, been overcome by the discovery of the modified condition of that body known as red or amorphous phosphorus, made by Professor Anton Von Schrötter of Vienna in 1845, and the utilization of that substance in the now well-known "safety matches" invented by Lundström of Sweden in 1855.

MATÉ, or PARAGUAY TEA, consists of the dried leaves of *Ilex paraguayensis*, St. Hil., an evergreen shrub or small tree belonging to the same natural order as the common holly, a plant to which it bears some resemblance in size and habit. The leaves are from six to eight inches long, shortly-stalked, oblong wedge-shaped, rounded at the upper end, and finely toothed at the margin. The small white flowers grow in forked clusters in the axils of the leaves; the sepals, petals, and stamens are four in number; and the berry is four-seeded. The plant grows abundantly in Paraguay, Corrientes, Chaco, and the south of Brazil, forming woods called *yerbales*.

MATERA, a city of Italy in the northeast of the province of Potenza, forty-eight miles from Potenza, on the high road to Bari. Population, 18,000.

MATERIALISM is that system of philosophy which ascribes to matter the final cause of all phenomena,

Lord Bacon, by his method of inductive reasoning, probably did more to advance the cause of materialism than any other one man. His system was followed and elaborated by Hobbes, who went to the extreme analysis of what Bacon had started. Hobbes claimed that the mind itself was material, and that consciousness was the result of the properly performed functions of our various organs. Sensation he ascribed to the impact of external matter upon the internal matter of mind—like as the beat of the wave on the seashore; the environment of the individual constituting, as it were, the sea, and the mind being in a like sense the beach on which the waves beat and produce impressions; or, to use a more apt illustration, the mind is the diaphragm of a telephone which communicates sensations to the individual by reason of impact of surrounding matter on this diaphragm. The mind, like other matter, is elastic, and receives impressions from contact with other

The great weaknesses of materialism pointed out by its adversaries are that no physical phenomena can be explained by the mere external elements presented. Apart from these there is always an apprehension of force or power. This power is never accounted for, and must be something outside of the physical or material. Even the Epicurean theory that the heavier atoms sank and caused the lighter ones to be displaced leaves the attribute of weight unexplained, for, as Morell suggests, it does not cover the point to say a heavier body sinks in a lighter element in obedience to a law of gravity, for behind the *law* must be a force which, constantly acting in a uniform manner, gives rise to such a law. This force the materialist does not explain. Besides this, materialism must begin with the eternity of matter. This is contrary to all our knowledge of matter and the inferences which our experience justifies us in drawing. That matter can spring into being spontaneously seems incapable of admission, for no matter how small the ultimate subdivision from which it starts there is left unexplained the mystery of its existence. The Creator of matter and the Giver of the laws in obedience to which it grouped itself into its present shapes are still to be accounted for, and as long as these facts remain materialism must be a hypothesis. As far as regards our mental experience it is claimed that, while to a great extent mental phenomena are dependent on physical conditions such as a healthy state of the brain, etc.,

yet our mental possessions are not wholly the result of such physical attributes. The mind is claimed to be a spiritual entity, invisible, and certain mental operations and experiences are inexplicable on the hypothesis of materialism. The last and crowning argument against materialism offered by its opponents is the "unity of design" in creation, which they claim indisputably shows the presence of the guiding mind and powerful hand of an omnipotent being—the Creator—that such a coördination cannot be the result of accident.

MATHEMATICAL DRAWING AND MODELING. The necessity for geometrical drawings and models is as old as geometry itself. The figure has formed the basis of many a geometrical truth; and demonstration by mere inspection of this has frequently to do service for more rigorous proof. So necessary is this visual representation of an idea that there is hardly a branch of mathematics which does not make use of it in the form of tables, symbols, formulæ, etc. The visual method is especially important in geometry. The figure is to the geometer what the numerical example is to the algebraist—on the one hand limiting the horizon, on the other imparting life to the conception. Herein lies the didactic value of the figure, which is the more indispensable the more elementary the stage of instruction. To be able to dispense with it is a faculty acquired only after a long and special training. The power of mental picturing is a talent which can be so strengthened by use that even a slightly gifted mind may acquire the power of carrying out a series of geometrical operations without the aid of a figure, provided these do not lead into unfamiliar regions. But each new group of ideas which the geometer would master requires a new graphic setting forth, which not even the experienced can dispense with. Drawings are sufficient in plane geometry; but solid geometry requires models, except in specially simple cases, in which delineation by means of perspective or some conventional method may suffice. Then, again, in passing from the geometry of the plane, straight line, and point in space to that of curved surfaces, tortuous curves, etc., new and distinct graphical methods are necessary. The difficulties encountered in understanding new groups of geometrical forms are best removed by a careful study of a small number of characteristic models and drawings. As a means of education, the model is lively and suggestive, forming in this way a completing factor in the course of instruction.

MATHEMATICS. Any conception which is definitely and completely determined by means of a finite number of specifications, say by assigning a finite number of elements, is a mathematical conception. Mathematics has for its function to develop the consequences involved in the definition of a group of mathematical conceptions. Interdependence and mutual logical consistency among the members of the group are postulated, otherwise the group would either have to be treated as several distinct groups, or would lie beyond the sphere of mathematics.

As an example of mathematical conception we may take "a triangle," regarded without reference to its position in space, this is determined when three elements are specified, say its three sides; or we may take a "color sensation," which, on Young's theory, is determined when the amounts of the three fundamental color sensations that enter into it are stated. As an example of a non-mathematical conception we may take "a man," "a mineral," "iron," no one of which admits of being so determined by a finite number of specifications that all its properties can be truly said to be deducible from the definition.

A mathematical conception is, from its very nature, abstract; indeed its abstractness is usually of a higher order than the abstractness of the logician. Thus, for instance, we may neglect the other attributes of a body and consider merely its form; we thus reach the abstract idea of "form." But the form of an irregular fragment of stone does not admit of being finitely specified, and is therefore not susceptible of mathematical treatment. If, however, we have a carefully squared cubical block of granite to deal with, for most practical purposes its form is specified by stating that it is a cube, and assigning one element, viz., an edge of the abstract mathematical cube by which we replace it. This example illustrates at once the limits of mathematical reasoning and the nature of the bearing of mathematics on practice.

A variety of words have been used to denote the dependence of a mathematical conception upon its elements. It is frequently said, for instance, that the conception is a "function" of its elements. One word has recently come into use which is very convenient, inasmuch as it draws attention at once to the fundamental idea involved in mathematical conception and to the prime object of mathematical contemplation, viz., "manifoldness."

Number is involved in the notion of a manifoldness both directly, as anyone can see, and also indirectly in a manner which the mind untrained to mathematical thinking does not so readily understand. Take on the one hand the case of a triangle considered without reference to its position but merely as composed of three limited straight lines, it may be completely determined in various ways by assigning three elements. A triangle may therefore be called a triple discrete manifoldness. A plane quadrilateral considered in the same way (being fully determined when four sides and a diagonal are known) is a quintuple discrete manifoldness; and a plane polygon of n sides as $(2n-3)$ -ple discrete manifoldness. Consider on the other hand the assemblage of points on a given straight line, they are infinite in number yet so related that any one of them is singled out by assigning its distance from an arbitrarily chosen fixed point on the line. Such an assemblage is called a one-fold continuous manifoldness, or simply a onefold manifoldness; another example of the same kind is the totality of instants in a period of time. The assemblage of points on a surface is a twofold manifoldness; the assemblage of points in tridimensional space is a threefold manifoldness; the values of a continuous function of n arguments an n -fold manifoldness.

It should be observed that the distinction between discrete and continuous manifoldness is not of necessity inherent in the conception. For one purpose we may treat a conception as a discrete manifoldness, for another as a continuous manifoldness. Thus we have seen that an unlimited straight line may be treated as a onefold continuous manifoldness; but, if we regard it as a whole, and with reference to the fact that its position in space is determined by four data, it becomes a quadruple discrete manifoldness.

The primary, although not the only, operation in the treatment of a discrete manifoldness is numbering or counting; hence arises the pure mathematical science of number, comprehending (abstract) *Arithmetic* and its higher branch commonly called the *Theory of Numbers*. Without entering into a discussion of the definitions and axioms of the science of number, it will be sufficient here to remark that all numerical operations are reducible to three fundamental laws commonly called the commutative, associative, and distributive laws. The four fundamental processes, or four species, as they are sometimes called, two of which, addition and multiplication,

are direct, and two, subtraction and division, inverse, are solely defined by and derive their meaning from the three laws of operation just mentioned.

A careful consideration of the methods in vogue for dealing with continuous manifoldness shows that they reduce themselves to two, which may be called the synoptic method and the analytic method. In the synoptic method we deduce the properties of a manifoldness by contemplating it as a whole, aiding our understanding, when it is necessary to do so, by a diagram, a model, or any other concrete device more or less refined according to circumstances. In the analytic method we fix our attention upon the individual elements of the manifoldness, usually defining each element by a definite number of specifications the variation of which leads us from element to element of the given manifoldness. We examine the properties of an element in the most general manner, and from them we predicate the properties of the manifoldness as a whole.

The best and most familiar examples of the synoptic treatment of manifoldness are the different varieties of pure geometry. Among these we may mention the apagogic geometry of the Greeks, which starts with a collection of definitions and axioms, enunciates and proves proposition after proposition with great attention to strict logical form and with continual reference to the grounds of inference, but pays little attention to the ordering of theorems with a view to mutual illustration, and carefully suppresses all traces of the method by which the propositions were or might have been discovered. It is true that the Greeks were in possession of a method, called by them analysis, which had for its object the discovery of geometrical truth. But this consisted merely in taking any proposition suspected to be true and tracing its consequences until one was reached which each either contradicted a known proposition or else was true and capable of leading by a direct process of reasoning (synthesis) to the proposition in question. In this we have no trace of the systematic development of geometric truth, and the method was apparently regarded by the ancients themselves as imperfect, for it makes no figure in such of their systematic treatises as have reached us. In somewhat sharp contrast with the Grecian geometry, but still essentially synoptic in method, stand the different varieties of modern geometry, which aims at greater generality in its definitions, pays less explicit attention to logical form, but arranges geometrical propositions as much as possible in the natural order of development or discovery, and above all makes extensive use of the principle of continuity. As examples of the modern geometry may be cited the descriptive geometry (*Géométrie Descriptive, Darstellende Geometrie*) of Monge; the projective geometry (*Géométrie Projective, Geometrie der Lage*) of Poncelet, Steiner, and Von Staudt; and the geometry of transformation in general, of which projective geometry is but a particular case. There is one other highly interesting form of modern geometry, which, although analytic in some of its developments, and often exhibited in close alliance with other analytical methods, is nevertheless synoptic as to its fundamental principle, viz., arithmic geometry (*Abzählende Geometrie*) or theory of characteristics, which originated in the characteristic equations of Plücker, and was developed into a powerful special method by Chasles and others. (See GEOMETRY and CURVE.)

Geometry, however, is not the only field for the synoptic treatment of manifoldness. This is obvious if we reflect that any magnitude whatever may be represented by a line; so that any function of not more than two elements may be represented by a geometrical construction and treated by any method applicable in ge-

ometry. Since the famous dissertation of Riemann, *On the Hypotheses that form the Basis of Geometry*, mathematicians have been familiar with the fact that the methods of geometry suitably generalized can be applied to the treatment of an n -fold manifoldness; and in point of fact the synoptic treatment of manifoldness under the name of n -dimensional geometry has been usefully employed by Cayley and others as an adjunct to the analytic method.

The fundamental characteristic of the analytical treatment of an n -fold manifoldness is the specification of an element by means of n continuously varying quantities or variables (see MEASUREMENT). For dealing with continuous as distinguished from discrete quantity we have the special analytical method of the INFINITESIMAL CALCULUS (*q.v.*), built upon the notion of a limit, with its various branches, viz., the differential calculus, the integral calculus, including differential equations, the calculus of functions, and the theory of functions in general (see FUNCTION). But, whether we make use of the algorithm of the infinitesimal calculus or not, we find upon examination that all analytical operations with continuous quantity fall under the three laws of commutation, association, and distribution, so that they are fundamentally identical with the operations with discrete quantity; the difference so far as there is any consists simply in the greater generality of the operand. The same fact may be looked at instructively in another light. Whether we consider analytical processes in concrete applications or look at them abstractly, we are equally led to the notion of a unit, by the multiplication or subdivision of which all the other quantities that enter into our calculus are derived. The exigencies of continuity are met by allowing that the multiplication or subdivision of the unit can be carried on to an unlimited extent; but in any case where analytical formulæ have to be reduced to arithmetical calculation (in which of course only a finite number of figures or arithmetical symbols can be used) the subdivision (or multiplication) of the unit actually stops short at a certain point; in other words, all our methods are, in practice at least, discrete. Here therefore we have the meeting point of discrete and continuous quantity, and on this ground alone we might infer the fundamental identity of their laws of operation.

The abstract science of quantity which we have just seen to be the essential part of the analytic treatment of manifoldness receives the name of ALGEBRA (*q.v.*). In addition to those already mentioned, we may enumerate the following as among the more important departments of applied mathematics: Kinematics; Abstract Dynamics, including Statics and Kinetics whether of a Particle, of a Rigid Solid, of an Elastic Solid, of a Fluid, or of a Chain; Statistical Mathematics, as exemplified in the Theory of Annuities, and the Kinetic Theory of Gases; the Mathematical Theory of Diffusion whether of Heat or of Matter; the Theory of Potential; and so on. (See MECHANICS, HYDROMECHANICS, ANNUITIES, HEAT, ELECTRICITY, MAGNETISM, etc.)

MATHER, COTTON, born in 1663, was the most learned and widely known of a family which enjoyed singular consideration, and exercised commanding influence upon New England in its first century. Richard, son of Thomas Mather of Lowton (Winwick), Lancashire, England, after studying for a time at Brasenose, Oxford, and teaching and subsequently preaching at Toxteth Park, went to New England, for nonconformity's sake, in the summer of 1635, where, till his death in 1669, at seventy-three, he was pastor of the Congregational church in Dorchester (now a part of Boston). His youngest son Increase took his first degree at Harvard College in 1656, at seventeen

—returning, after a visit to the old country, in which he served several pulpits, to take at twenty-five the pastorate of the second (or North) church in Boston, which place he held till his death in 1723 at eighty-five, while, in addition, he had been acting, or actual, president of the college most of the time from 1681 to 1701, the author of 160 books or tracts, and for four of its most perilous years the choice of all its citizens to represent the Massachusetts colony before the English Government. His wife Maria was daughter of the famous John Cotton, and their first-born received both family names, and took his B.A. degree at less than sixteen, at Harvard, in 1678. As a pastor he was exceptionally laborious. As a philanthropist, while abundant in personal benefactions, he originated more than twenty societies for public charity, bore the cost of a school for Christianizing the negroes, and, at the risk of life, in the face of popular opposition medically led, advocated and vindicated the introduction of inoculation as a protection against the then terrible ravages of the smallpox. As an author he was learned—publishing in French, Spanish, and Algonquian as well as English—and voluminous, 382 of his printed works having been catalogued, several of which are elaborate books, and one a folio of 800 pages; while his *Biblia Americana*, by him considered the great work of his life, remains in six huge volumes of manuscript to this day. He was superstitious, and it was his misfortune that, as to witchcraft, he was not, as with vaccination, in advance of his generation, any more than such men as Richard Baxter and Sir Matthew Hale. Of his works, the *Magnalia* and *Ratio Disciplina* are indispensable to the student of New England history. He died in 1728.

MATHEW, THEOBALD, popularly known as Father Mathew, the "Apostle of Temperance," was descended from an illegitimate branch of the Llandaff family, and was born at Thomastown, Tipperary, on October 10, 1790. He received his school education at Kilkenny, whence he passed for a short time to Maynooth; from 1808 to 1814 he studied at Dublin, where in the latter year he was ordained to the priesthood. Having entered the Capuchin order, he, after a brief time of service at Kilkenny, joined the mission in Cork, which was the scene of his religious and benevolent labors for many years. The movement with which his name is most intimately associated began in 1838 with the establishment of a total abstinence association, which in less than nine months, thanks to his moral influence and eloquence, enrolled no fewer than 150,000 names. It rapidly spread to Limerick and elsewhere, and some idea of its popularity may be formed from the fact that at Nenagh 20,000 persons are said to have taken the pledge in one day, 100,000 at Galway in two days, and 70,000 in Dublin in five days. In 1849 he paid a visit to the United States, returning in 1851. He died at Queenstown on December 8, 1856.

MATHEWS, CHARLES, comedian, was born in London, June 28, 1776, and died at Plymouth June 28, 1835.

MATHEWS, CHARLES JAMES comedian, son of the above, was born at Liverpool, December 26, 1803, and died July 26, 1878.

MATILDA, countess of Tuscany, popularly known as the Great Countess, was born in 1046, of a race of nobles of Lombard descent. Matilda was twice married, first to Godfrey of Lorraine, surnamed the Hump-backed, son of her mother's second husband, and secondly to Guelph of Bavaria—both marriages of policy, which counted for little in her life. She died of gout in 1114, in her sixty-ninth year, and was buried first at San Benedetto, and finally in the Vatican.

MATLOCK, a town of Derbyshire, England, is situ-

ated on the river Derwent and on the Midland Railway, 149 miles northwest of London and seventeen northwest of Derby. Population, about 6,000.

MATSYS, QUINTIN. See MASSYS.

MATTEAWAN, a New York town, in the county of Dutchess, lies on Fishkill Creek about sixty miles from New York city. It has extensive water-power and numerous manufactures, together with banks, newspapers, churches, schools, telegraphs, and rail-carries on considerable trade, and has a population (1900) of 5,807.

MATTER, PROPERTIES OF. If we knew thoroughly the nature of any piece of matter, the deduction of its properties would be a question of mere reasoning, just as (for instance) the definition of a circle really involves all the properties which mathematical methods have deduced from it. But, as we do not even know what matter is, in the abstract, the converse operation is (at least for the present) the natural and necessary one. We must endeavor from the experimentally ascertained properties of matter to discover what it is. The reader will find the limits of our present knowledge in the article ATOM. The properties of matter may be arranged in several classes, thus:

1. Properties of matter in itself; such as Inertia, Hardness, Brittleness, ELASTICITY (*q.v.*), Density, Compressibility, Viscosity, etc. These depend upon its ultimate structure and upon the law and intensity of the so-called molecular forces. (See ATOM, CONSTITUTION OF BODIES, ATTRACTION.)

2. Relative properties of different kinds of matter, chemical, catalytic, etc. (See CAPILLARY ACTION, CHEMISTRY, DIFFUSION, etc.)

3. Properties relative to different forms of energy: Conductivity (Thermal and Electric), Specific Gravity, Specific and Latent Heat, Transparency, Color, Specific Inductive Capacity, Radiating and Absorbing Power, Magnetic Retentiveness, etc., Thermo-electric Position, Refractive Index, Reflective Power, Double Refraction, Rotatory Polarization, etc.

MATTEUCCI, CARLO, an Italian physicist, was born at Forlì, June 20, 1811, and died at Leghorn, June 25, 1868.

MATTHEW, a shortened form of Mattaniah or Mattithiah, equivalent to Theodorus; one of the twelve apostles of Jesus Christ, and, according to tradition, the author of the First Gospel. In its full Hebrew form the name occurs several times in the Old Testament, being borne by more than one person of priestly or Levitical family. Matthew, in the Gospel which bears his name, is described as having been a tax-gatherer, and the circumstances of his call to become a follower of Jesus, which he received as he sat at the "receipt of custom" or "tax office" in one of the towns by the Sea of Galilee, are briefly related in chap. ix. 9. It has sometimes been doubted, but without any good reason, whether the precisely parallel narrative relating to "Levi the son of Alphæus" has reference to the same person (compare the double names Simon and Peter, Josès and Barnabas, and others). In the lists of the names of the apostles given in the synoptical Gospels and in the Acts, Matthew ranks third or fourth in the second group of four. Little is recorded of him except the feast which he gave in his house at the beginning of his discipleship; the way in which this is related seems to indicate that he was (comparatively at least) a wealthy man. He was also present in the "upper room" at Jerusalem after the ascension, when Matthias was elected to be the successor of Judas. Tradition has nothing trustworthy to tell about his subsequent career, but there is nothing inherently improbable in the allegation of Eusebius that he spent several years in Jerusalem preaching to the Hebrews (and writ-

ing the Gospel which bears his name), or that he afterward extended his missionary activities in other directions.

MATTHEW, GOSPEL OF. See **GOSPELS**.

MATTHEW OF PARIS, one of the most important writers in connection with English mediæval history, was born about the year 1200, or possibly somewhat earlier.

We have it on his own authority, as recorded in an autograph marginal note, that he assumed the monastic habit at the abbey of St. Alban's on January 21, 1217. In 1236 he accompanied the newly-elected prior of his abbey, John of Hertford, to London, to attend the ceremony of the nuptials of Henry III. and Eleanor of Provence; and in October, 1247, he was at Westminster, in order to be present at the celebration of the feast of St. Edward the Confessor, when he was desired by the king himself to write an account of the proceedings. The most important event in his tranquil and uneventful life (which was passed chiefly within the walls of his monastery) occurred in the year 1248, when he was sent on a mission to the Benedictine monastery of Holm (Thronthjem), which had become involved in difficulties owing to the maladministration of one of its abbots. The last incident recorded by the historian himself with respect to his own career is the fact that he exerted his influence with Henry on behalf of the university of Oxford, when that body found its privileges endangered by the encroachments of the bishop of Lincoln. In his latter years, Matthew's growing infirmities compelled him to have recourse to the aid of a fellow-monk in order to complete his works; this assistance is to be traced in the *Historia Anglorum* from 125: to the end of the work (1253); in the *Abbreviatio Chronicorum* for the years 1253, 1254, and 1255; and in the *Chronica Majora* for the years 1258 and 1259. Matthew died after the month of May, 1259.

MATTHIAS, Holy Roman emperor, the fourth son of the emperor Maximilian II., was born on February 24, 1557. In 1595 Matthias was made regent in Austria, and in 1606 the archdukes recognized him as head of the house of Hapsburg. In 1612, after the death of Rudolph, Matthias was elected emperor; and his reign was not less disturbed than that of his predecessor. The intervention of Turkey in Transylvania led to war, and in 1615 Matthias, being unsupported by the empire and by his own estates, found that he had no alternative but to conclude peace for twenty years on humiliating terms. He died March 20, 1619.

MATTHIAS CORVINUS, king of Hungary, was born at Klausenburg, in Transylvania, on March 27, 1443, and died at Vienna on April 6, 1490. He was the younger son of John Hunyady (Corvinus), who died in 1456, after having been "governor of Hungary" from 1446 to 1453. On the death of John, the elder of his two sons (Ladislaus) was executed by command of Ladislaus Posthumus, while Matthias was imprisoned at Prague; but shortly after the king's own death without issue in 1457, Matthias Hunyady (Corvinus) was elected by the Hungarian magnates to the vacant throne (January 24, 1458). The leading events of his reign are summarized in the article **HUNGARY**.

MATTING. Under this name are embraced many coarse woven or plaited fibrous materials used for covering floors or furniture, for hanging as screens, for wrapping up heavy merchandise, and for other miscellaneous purposes.

MATTOON, a post-town of Illinois, is an important railroad center. It lies in Coles county, and has considerable manufactures. It has banking, school, and church accommodations, and several newspapers are published here. It has telegraph facilities, and the car-

shops of the Illinois Central railroad are located here. Population, 9,622 (1900 census).

MATURIN, CHARLES ROBERT, born in 1782, died in 1824, Irish novelist and dramatist, perplexed the serious and served as a butt for the light-minded critics of the first quarter of the nineteenth century.

MAUBEUGE, a fortified place of northern France, situated on both banks of the Sambre, 142 miles by rail northeast from Paris, and about two miles from the Belgian frontier. Its fortifications were planned by Vauban; the enceinte is pierced by two gateways, that of France and that of Mons. Population about 15,000.

MAULMAIN, or **MOULMEIN**, a town in Amherst district, British Burmah, situated on the left bank of the Salwin river. Population about 60,000.

MAUNDY THURSDAY, the day preceding Good Friday. The word "maundy" (Middle-English *maunde* or *maunde*, a command) is identical with the "mandatum" of the rubric and anthem of the Missal for the fifth day in Holy Week, sometimes called "Dies Mandati."

MAUPERTUIS, PETER LOUIS MOREAU DE, a mathematician and astronomer of considerable reputation in his day, was born at St. Malo, July 17, 1698. When twenty years of age he entered the army, becoming lieutenant in a regiment of cavalry, and employing his leisure on mathematical studies. After five years he quitted the army and was admitted, in 1723, a member of the Academy of Sciences. In 1728 he visited London, and was elected a fellow of the Royal Society. In 1736 he acted as chief of the expedition sent by Louis XV. into Lapland to measure the length of a degree of the meridian within the polar circle, in order to settle the then much disputed question of the oblate figure of the earth, and, on his return home, he became a member of almost all the scientific societies of Europe. In 1740 Maupertuis went to Berlin on the invitation of the king of Prussia, and took part in the battle of Mollwitz, where he was taken prisoner by the Austrians. On his release he returned to Berlin, and thence to Paris, where he was elected director of the Academy of Sciences in 1742, and in the following year was admitted into the Academy. In 1746 he was chosen president of the Royal Academy of Sciences. Finding his health declining, he repaired, in 1757, to the south of France, but went in 1758 to Basel, where he died July 27, 1759.

MAU RANIPUR, a town in Jhânsi district, in the Northwestern Provinces of India. The population is 16,428.

MAURER, GEORG LUDWIG VON, a distinguished German jurist and statesman, was born at Erpolsheim, in the Bavarian Palatinate, November 2, 1790, and died at Munich, May 9, 1872.

MAURETANIA, or **MAURITANIA** (the former is the more correct form of the name, according to coins and inscriptions), was the name given in ancient geography to the district which constituted the northwestern angle of the African continent. It comprised a considerable part of the modern empire of Morocco, together with the western portion of Algeria. But its limits varied much at different times.

MAURICE (MAURICIUS), ST., and his companions are commemorated as martyrs by the Roman church on September 22d. The earliest extant form of the legend relating to them is that of Eucherius, bishop of Lyons about the middle of the fifth century, who tells us that Maurice was in command of the Theban legion (so called because raised in the Thebais) when it was sent into the West and attached to the army of Maximian. Themselves Christians to a man, its members refused to persecute their co-religionists, and for this,

after having twice been decimated, the legion was utterly destroyed by command of the emperor at Octodurum (Martigny), near Geneva.

MAURICE (MAURICIUS FLAVIUS TIBERIUS), emperor of the East from 582 to 602, was of Roman descent, but a native of Arabissus, in Cappadocia, where he was born about 539. He spent his youth at the court of Justin II., and, having joined the army, fought with distinction in the Persian war (578-581). At the age of forty-three he was declared Caesar by the dying emperor Tiberius II., who bestowed upon him the hand of his daughter Constantina. The capital having declared against him, Maurice abdicated and withdrew to Chalcedon, but was pursued and put to death there after having witnessed the murder of five of his sons (November 27, 602).

MAURICE OF NASSAU, prince of Orange, the younger son of William the Silent, was born at Dillenburg in 1567, and was made governor of the United Provinces after the assassination of his father in 1584. He succeeded his brother as prince of Orange in 1618, and died at the Hague on April 23, 1625. For the leading features of his character and events of his life see HOLLAND.

MAURICE, duke and elector of Saxony, was the son of Duke Henry the Pious, and was born on March 21, 1521. He received a liberal education, and at an early age gave evidence of an energetic and ambitious temper. In 1541 he married Agnes, daughter of the landgrave Philip of Hesse, and succeeded his father as duke of Saxony, of the Albertine line. Although a Protestant, he held cautiously aloof from the League of Smalkald, and in 1542 and 1543 he received imperial favor by supporting Charles V. against the Turks and the French. In 1546, when Charles V. attacked the League of Smalkald, Maurice sided with the emperor, the result being that he was made elector of Saxony in place of his cousin John Frederick (of the Ernestine line), who was taken prisoner and deposed. In 1551 Maurice concluded a treaty with Henry II. of France against the emperor, and an alliance was also formed with several German princes. Charles V. refused to believe in the reality of the danger; but in March, 1552, he was startled by the intelligence that Henry II. had entered Germany as an invader, and that Maurice was hastening southward at the head of a powerful army. John Frederick and Philip were at once released, and the emperor, after an ignominious flight, was compelled to sign the treaty of Passau. After the reestablishment of peace Maurice fought for some time against the Turks in Hungary; he then returned to Saxony, and associated himself with the alliance against Margrave Albert of Brandenburg, by whom the treaty of Passau had not been recognized. At Sievershausen, on July 9, 1553, the margrave was defeated; but during the battle Maurice was wounded, and two days afterward he died in his tent.

MAURICE, JOHN FREDERIC DENISON, better known without his first name, an English clergyman and theologian, was born in the year 1805, and died April 1, 1872.

MAURITIUS, formerly called the ISLE OF FRANCE, an island in the southwestern portion of the Indian Ocean, 550 miles east of Madagascar, and 115 miles northeast of the island of Réunion, 940 miles southeast of the Seychelles, 2,300 miles from the Cape of Good Hope, and 9,500 miles from England *via* Aden and Suez. The island is irregularly elliptical—somewhat triangular in shape—and is 36 miles long from north-northeast to south-southwest, and about 23 miles broad. It is 130 miles in circumference, and its total area is about 713 square miles. The island is surrounded by coral reefs, so that the ports are difficult of access. Pop. (1901), civil, 367,472; military, 2,935.

MAURUS, ST., according to the Roman Breviary (January 15th), was a Roman of noble birth, and while still a child was placed by his father Euty chius under the discipline of St. Benedict, where he soon became a model of all the virtues and endowed with the gift of miracles. Sent by his master into Gaul, he founded a monastery over which he presided for forty years. When he died, in 565, he was over seventy.

MAURY, JEAN SIFFREIN, cardinal and archbishop of Paris, the great opponent of Mirabeau in the constituent assembly, and esteemed his rival in eloquence, was the son of a poor cobbler, and was born in 1746 at Valréas in the Venaissin, the district in France which belonged to the pope. His quickness was soon observed by the priests of Avignon, where he was educated and took orders. He became a favorite preacher in Paris, and was Lent preacher at court in 1781, when King Louis XVI. said of his sermon, "If the abbé had only said a few words on religion he would have discussed every possible subject." In 1781 he obtained the rich abbey of Lions, worth 20,000 livres a year, and in 1785 he was elected to the Academy. His morals were as loose as those of his great rival Mirabeau, but he was famed in Paris for his wit and gayety as well as for his eloquence and his immorality. In 1789 he was elected a member of the states-general by the clergy of Péronne, and from the first proved to be the most able and persevering defender of the *ancien régime*. His life was often in danger among the people, but his ready wit always saved it, and it was said that one *bon mot* would preserve him for a month. At last, in 1792, he found it necessary to fly from Paris. When he did emigrate he found himself regarded as a kind of martyr to the church and the king, and was at once named cardinal, archbishop *in partibus*, and extra nuncio to the diet at Frankfurt. He was finally made bishop of Montefiascone, and settled down in that little Italian town. In 1804 he began to prepare his return to France by a well-turned letter to Napoleon, congratulating him on restoring religion to France once more. In 1806 he did return; in 1807 he was again received into the Academy; and in 1810, on the refusal of Cardinal Fesch, was made archbishop of Paris. On the restoration of the Bourbons he was summarily turned out of the Academy, and sent to Rome to answer for his disobedience to the pope. There he was imprisoned in the castle of St. Angelo for six months, and died in 1817, a year or two after his release.

MAURY, MATTHEW FONTAINE, American naval officer and hydrographer, was born in Spottsylvania county, Va., January 14, 1806. In 1825 he entered the American navy as midshipman, circumnavigating the globe in the *Vincennes*, during a cruise of four years. In 1836 he was made lieutenant and gazetted astronomer to an exploring expedition. In 1839 he met with an accident which resulted in permanent lameness, and unfitted him for active service. Maury was placed in charge of the Depot of Charts and Instruments, out of which have grown the United States Naval Observatory and the Hydrographic Office. He labored assiduously and with complete success to place the depot in a state of efficiency. While in the *Vincennes* and in subsequent cruises, Maury made many observations as to the winds and currents, and when in charge of the Hydrographic Office he set himself to collect further data by distributing to captains of vessels specially prepared log-books. So successful was he in this enterprise that in the course of nine years he had collected a sufficient number of logs to make two hundred manuscript volumes, each with about two thousand five hundred days' observations. One result was to show the necessity for combined action on the part of maritime nations in regard to ocean meteorology. This led to ar

international conference at Brussels in 1853, which produced the greatest benefit to navigation as well as indirectly to meteorology. One result was the establishment of the meteorological department of the English Board of Trade, now known as the Meteorological Office, which adopted Maury's model log-books. In 1853 he published his *Letters on the Amazon and Atlantic Slopes of South America*, and in 1855 he was promoted to the rank of commander. On the outbreak of the American civil war in 1861, Maury threw in his lot with the South, and, having lost nearly his all, retired to England, where he was presented with a handsome testimonial raised by public subscription. Afterward he became imperial commissioner of emigration to Maximilian of Mexico, on whose death he took up his residence in Virginia, where he died on February 1, 1873.

MAUSOLUS, or according to his coins *Maussolus*, a king of Caria, whose reign probably began in 377 and terminated with his death in 353 B.C. He is best known from the tomb erected for him by his widow Artemisia with such cultured magnificence that the name of mausoleum has become the generic title of all similar monuments.

MAXENTIUS, MARCUS AURELIUS VALERIUS, Roman emperor from 306 to 312, was the son of Maximianus Herculus, and the son-in-law of Galerius, but on account of his vices and incapacity was left out of account in the division of the empire which took place in 305. A variety of causes, however, had produced strong dissatisfaction at Rome with many of the arrangements established by Diocletian, and the public discontent on October 28, 306, found expression in the massacre of those magistrates who maintained their loyalty to Severus and in the election of Maxentius to the imperial dignity—an election in which the rest of Italy, as well as Africa, concurred. With the help of his father, Maxentius was enabled to put Severus to death and to repel the invasion of Galerius; his next steps were first to banish Maximian, and then, after achieving a military success in Africa against one Alexander, to declare war against Constantine for the conduct toward the old emperor of which he in turn had been guilty at Marseilles. The contest resulted in the defeat of Maxentius at Saxa Rubra, and his death by drowning in the Tiber at the Milvian Bridge on October 28, 312. (See CONSTANTINE.)

MAXIMA AND MINIMA. The consideration of the greatest or the least value of a variable quantity, that is restricted by certain conditions, is a problem of which several simple cases were investigated by the early Greek geometers. In the progress of mathematics the terms maxima and minima have come to be used to imply, not the absolutely greatest and least values of a variable magnitude, but the value which it has at the moment it ceases to increase and begins to decrease, or *vice versa*. For example, if it be said that the height of the barometer is a maximum at any instant it means that up to that time the barometer was rising and then began to fall. In this way it is possible that there should be several maxima and minima in the course of one day, and that one of the minima should be greater than one of the maxima.

MAXIMIANUS, MARCUS AURELIUS VALERIUS, surnamed HERCULIUS, Roman emperor from 286 to 305, and again in a doubtful manner for some time prior to 308, was by birth a Pannonian peasant, but achieved great distinction in the course of long service in the army in almost every quarter of the empire, and, having been made Cæsar by Diocletian in 285, received the title of Augustus in the following year (April 1, 286), with the honorary appellation of Herculus. In 287 he suppressed the rising of the peasants (Bagaudæ) in

Gaul, but in 289, after a three years' struggle, his colleague and he were compelled to acquiesce in the assumption by his lieutenant Carausius of the title of Augustus in Britain. After 292, Maximian left the care of the Rhine frontier to Constantius Chlorus, who had been designated Cæsar in that year, but in 297 his arms achieved a rapid and decisive victory over the barbarians of Mauretania, and in November, 303, he shared at Rome the triumph of Diocletian, the last pageant of the kind ever witnessed by that city. On May 1, 305, the day of Diocletian's abdication, he also divested himself of the imperial dignity at Milan, and retired to a villa in Lucania; in the following year, however, he was induced to reassume the purple. In 307 he brought the emperor Severus a captive to Rome, and also compelled the retreat of Galerius, but in 308 he was himself driven by Maxentius from Italy into Illyricum. Here a false report was received, or invented, of the death of Constantine, at that time absent on the Rhine, and Maximian at once grasped at the succession, but was soon driven to Marseilles, where, having been delivered up to his pursuers, he strangled himself in 310 (February).

MAXIMIANUS, GALERIUS VALERIUS, usually referred to by his name GALERIUS, Roman emperor from 305 to 311, was born near Sardica in Dacia, and served with distinction as a soldier under Aurelian and Probus, and in 292 was designated Cæsar along with Constantinus, receiving in marriage Diocletian's daughter Valeria, and at the same time having assigned to him as his special charge the care of the Illyrian provinces. In 296, at the beginning of the Persian war, he was removed from the Danube to the Euphrates. In 305, on the abdication of Diocletian and Maximian, he at once assumed the title of Augustus, along with Constantius, his former colleague, and having procured the promotion to the rank of Cæsar, of Severus, a faithful servant, and Daza (Maximinus), his nephew, he hoped, on the death of Constantius, to become sole master of the Roman world. This scheme, however, was defeated by the sudden elevation of Constantine at York on the death of his father, and by the action of Maximian and Maxentius in Italy. He died—of the *morbus pedicularis*, it is said—in May, 311.

MAXIMILIAN I., Holy Roman Emperor, the son of the emperor Frederick III., was born on March 22, 1459. In 1477 he married Mary, daughter of Charles the Bold of Burgundy, thus securing for his family the possessions of the house of Burgundy; and by the marriage of his son Philip with the infant Joana, in 1496, he prepared the way for the association of Spain with the empire under his grandson, Charles V. In 1486 Maximilian was chosen king of the Romans, and in 1493, after the death of his father, he succeeded to the imperial throne. Through the influence of his second wife, Blanca Sforza, daughter of Duke Galeazzo Sforza of Milan, he was induced to contend for supremacy in Milan and Naples; but his resources were inadequate for war on equal terms with the kings of France, Charles VIII. and Louis XII. In 1499 he carried on an unsuccessful war with the Swiss confederates, the result of which was that, by the peace of Basel, the confederates became practically independent of the empire. On the other hand, he was singularly fortunate in increasing the power of the house of Austria. By the death of his cousin, the archduke Sigismund, he inherited Tyrol; he also received Görz, Gradisca, the Pusterthal, and a part of Bavaria; and by the marriage of two of his grandchildren with children of the king of Hungary and Bohemia he took the first step toward the ultimate incorporation of these countries with the Austrian hereditary territories. At Wells, in Upper Austria, on January 12, 1519, he died.

MAXIMILIAN II., Holy Roman emperor, son and successor of Ferdinand I., was born at Vienna on August 1, 1527. In 1562 he became king of Bohemia and king of the Romans, in 1563 king of Hungary, and in 1564 emperor. At the time of his accession to the imperial throne Hungary was at war with Turkey. The sultan Soliman II. was conciliated by the cession of all the territories he had conquered in Hungary, and by the promise of a yearly tribute of 300,000 florins. Soon afterward Soliman renewed the war on behalf of the prince of Transylvania; but after his death, in 1566, his successor, Selim, concluded with Maximilian an armistice of eight years. Maximilian's brothers, Ferdinand and Charles, fought incessantly against Protestantism in their respective lands; but it was tolerated by Maximilian in Austria, Bohemia, and Hungary. His authority, however, was greatly limited by the influence of the Jesuits. He died on October 12, 1576. Of his eight children (six sons and two daughters) two—Rudolph II. and Matthias—became emperors.

MAXIMILIAN, archduke of Austria (Ferdinand Maximilian Joseph) and emperor of Mexico, was the second son of the archduke Francis Charles, and was born in Vienna on July 6, 1832. He was trained for the navy, and ultimately attained a high command in that branch of his country's service. In February, 1857, he was appointed governor of the Lombardo-Venetian kingdom, and in the same year he married the Princess Charlotte, daughter of Leopold I., king of the Belgians. On the outbreak of the war of 1859, he retired into private life, chiefly at Trieste, until 1863, when at the instance of Napoleon III. he accepted the crown which had been offered to him by the notables of Mexico. He landed at Vera Cruz on May 28, 1864, but from the commencement of his reign found himself involved in difficulties of the most serious kind, which in 1866 made apparent to almost everyone outside of Mexico the necessity for his abdicating. This, however, he declined to do. Withdrawing, in February, 1867, to Querétaro, he there sustained a siege for several weeks, but on May 15th resolved to attempt an escape through the enemy's lines. He was, however, arrested before he could carry out this resolution, and, after trial by court-martial, was condemned to death. The sentence was carried out on June 19, 1867. (See MEXICO.)

MAXIMINUS, CAIUS JULIUS VERUS, Roman emperor from 235 to 238, was of barbarian parentage, his father being a Goth and his mother an Alan, and was born in a village on the confines of Thrace, where his immense stature and enormous feats of strength first drew the attention of the emperor Septimius Severus. On March 19, 235, the troops saluted him emperor. The three years of his reign, which were spent wholly in the camp, were marked by great cruelty and oppression; the widespread discontent thus produced culminated in a revolt in Africa and the assumption of the purple by GORDIANUS, (*q.v.*) Maximin, who was in Pannonia at the time, marched against Rome, and passing over the Julian Alps descended on Aquileia; while detained before that city he and his son were murdered in their tent by a body of prætorians. Their heads were cut off and dispatched to Rome, where they were burnt on the Campus Martius by the exultant crowd (May, 238).

MAXIMINUS, GALERIUS VALERIUS, Roman emperor from 308 to 314, was originally an Illyrian shepherd, and bore the name of Daza. He rose to high distinction after he had joined the army, and in 305 he was raised by his uncle to the rank of Cæsar, with the honorary appellation of Jovius, Syria and Egypt being the government assigned to him. In 308, after the ele-

vation of Licinius, he insisted on receiving the title of Augustus; on the death of Galerius, in 311, he succeeded to the supreme command of the provinces of Asia, and, when Licinius and Constantine began to make common cause with one another, Maximin entered into a secret alliance with Maxentius. He came to an open rupture with Licinius in 313, sustained a crushing defeat in the neighborhood of Heraclea on April 30th, and, having fled first to Nicomedia and afterward to Tarsus, perished at the latter city in August following.

MAXIMUS, the name of four Roman emperors. In chronological order the first was M. Clodius Pupienus Maximus, who was associated with Balbinus in the imperial dignity by the senate for a short time in 238, before and after the death of the hated Maximin. The second was Magnus Clemens Maximus, a native of Spain, who shared the imperial dignity with Valentinian and Theodosius from 383 to 388. The third, Maximus Tyrannus, was made emperor in Spain by the Roman general Gerontius, who had rebelled against Constantine in 408. After the defeat of Gerontius at Arles, and his subsequent death in 411, Maximus renounced the imperial title and was permitted by Constantine to retire into private life. Lastly, Petronius Maximus was a member of the higher Roman nobility, and had held a large number of public offices, including those of præfectus Romæ (420) and of præfectus Italiæ (439-441 and 445). He was one of the intimate associates of Valentinian, who received his assistance in the palace intrigues which led to the death of Aetius in 454; but a brutal outrage committed on the wife of Maximus by the emperor turned his friendship into the bitterest hatred. Maximus was proclaimed emperor immediately after Valentinian's murder in March, 455, but reigned for less than three months, being murdered by some Burgundian mercenaries.

MAXIMUS, ST., abbot of Chrysopolis, known as "the Confessor," from his orthodox zeal in the Monothelite controversy, or as "the monk," was born of noble parentage at Constantinople about the year 580. Educated with great care, he early became distinguished by his talents and acquirements, and some time after the accession of the emperor Heraclius, in 610, was made his private secretary. In 630 he abandoned the secular life and entered the monastery of Chrysopolis (Scutari), actuated, it was believed, less by any longing for the life of a recluse than by the dissatisfaction he felt with the Monothelite leanings of his master. The date of his promotion to the abbacy is uncertain. In 662 he was brought to Constantinople and was condemned by a synod there to be scourged, to have his tongue cut out by the root, and his right hand chopped off. After this sentence had been carried out he was again banished to Lazica, where he died, August 13, 662.

MAXWELL, JAMES CLERK, born in 1831, was the last representative of a younger branch of the well-known Scottish family of Clerk of Penicuik. He was educated at the Edinburgh Academy (1840-47) and the university of Edinburgh (1847-50). Entering at Cambridge in 1850, he spent a term or two in Peterhouse, but afterward migrated to Trinity. He held the chair of natural philosophy in Marischal College, Aberdeen, from 1856 till the fusion of the two colleges there in 1860. For eight years subsequently he held the chair of physics and astronomy in King's College, London, but resigned in 1868 and retired to his estate of Glenlair in Kirkcudbrightshire. He was summoned from his seclusion, in 1871, to become the first holder of the newly-founded professorship of experimental physics in Cambridge; and it was under his direction that the plans of the Cavendish laboratory were prepared. For more than half of his brief life he held a prominent po-

sition in the very foremost rank of natural philosophers. He died in 1879.

MAXWELL, SIR WILLIAM STIRLING-, BART., man of letters, was born at Kenmure, near Glasgow, in 1818, and died in 1878.

MAY, the fifth month of our modern year, was the third of the old Roman calendar. The name is of doubtful origin. Ovid suggests the three derivations of *majestas*, *maiores* (the *patres* of the old Roman city), and *Maia*, the mother of Mercury, to whom the Romans were accustomed to sacrifice on the first day of the month. It was considered unlucky among the Romans to contract marriages during this month, on account of the celebration of the Lemuria—a superstition of which traces are still to be found among ourselves. In the Roman Catholic Church May is known as “the month of Mary.”

MAYA. See **MEXICO**.

MAYBOLE, a burgh of barony and market-town of Scotland, in the county of Ayr. Population, 4,500.

MAYENCE. See **MAINZ**.

MAYENNE, a department of northwestern France, three-fourths of which formerly belonged to Lower Maine and the remainder to Anjou, is bounded on the north by Manche and Orne, on the east by Sarthe, on the south by Maine-et-Loire, and on the west by Ille-et-Vilaine, having a maximum length from north to south of fifty-one miles, a breadth of thirty-nine miles, and an area of 1,096 square miles. Its ancient geological formations connect it with Brittany. The highest point of the department, and indeed of the whole northwest of France, is the Mont des Avaloirs (1,368 feet). Hydrographically Mayenne belongs to the basins of the Loire, the Vilaine, and the Sélune; the first-mentioned has the larger part of the entire area. The climate of Mayenne, which is that of the Sequanian region, is generally healthy except in the neighborhood of the numerous marshes. Of the entire area two-thirds are arable and a twentieth is under wood. The population in 1901 was 311,207.

MAYENNE, capital of an *arrondissement* in the above department of France, is an old feudal town irregularly built on two hillocks which overlook the river Mayenne, at the point where the railway from Caen to Laval is joined by that from Fougères to Alençon. The old castle still has toward the river five towers, one of which has retained its conical roof; the vaulted chambers and chapel are ornamented in the style of the thirteenth century; the building is now used as a prison. The population is 11,000.

MAYER, JOHANN TOBIAS, one of the greatest of last century's astronomers, was born at Marbach in Württemberg, February 17, 1723. He died February 20, 1762.

MAYER, JULIUS ROBERT, was born at Heilbronn in 1814, studied medicine at Tübingen, Munich, and Paris, and, after a journey to Java in 1840 as surgeon of a Dutch vessel, obtained a medical post in his native town. He claims recognition as an independent *a priori* propounder of the “First Law of Thermodynamics,” but more especially as having early and ably applied that law to the explanation of many remarkable phenomena, both cosmical and terrestrial. Mayer died in 1818.

MAYHEM (MAIM), an old term of the law signifying an assault whereby the injured person is deprived of a member proper for his defense in fight, *e.g.*, an arm, a leg, a fore tooth, etc. The loss of an ear, jaw tooth, etc., was not mayhem. The most ancient punishment in English law was retaliative—*membrum pro membro*, but ultimately at common law fine and imprisonment.

MAYKOP, a town of the Caucasus, Russia, in the province of Kuban, on the Byelaya, a tributary of the

Kuban, ninety-three miles to the southeast of Yekaterinodar, the capital of the province. Owing to its position in a very fertile country where settlers from Russia found plenty of rich soil which had been abandoned by the natives, Maykop has become a wealthy town, and its population has rapidly increased to 22,550.

MAYNOOTH, a village in the county of Kildare, province of Leinster, Ireland, is situated on the Royal Canal and on the Midland Great Western Railway, fifteen miles northwest of Dublin. The Royal Catholic College of Maynooth, instituted by the Irish parliament in 1765, is the chief seminary for the education of the Roman Catholic clergy of Ireland. It was supported by a parliamentary grant of \$130,000 a year, which at the disestablishment of the Irish Church in 1869 was commuted by the payment of a capital sum fourteen times its amount. The building is a fine Gothic structure by Pugin, erected by a parliamentary grant obtained in 1846.

MAYO, a maritime county on the west coast of Ireland, province of Connaught, is bounded north and west by the Atlantic Ocean, northeast by Sligo, east by Roscommon, southeast and south by Galway. Its greatest length from north to south is about seventy-five miles, and its greatest breadth about sixty-five miles. The total area is 1,318,400 acres, or 2,156 square miles.

About two-thirds of the boundary of Mayo is formed by sea, and the coast is very much indented, and abounds in picturesque scenery. The principal inlets are Killary Harbor, between Mayo and Galway; Clew Bay, in which are the harbors of Westport and Newport; Blacksod Bay and Broad Haven, which form the peninsula of the Mullet; and Killala Bay, between Mayo and Sligo. The islands are very numerous, the principal being Inishturk (area 1,445 acres, and population 132 in 1881), near Killary Harbor; Clare Island (area 3,949 acres, population 62), at the mouth of Clew Bay, where there are many islets all formed of drift; and Achil (area 35,838 acres, population 5,070), the largest island in Ireland.

There are some very fertile regions in the level portions of the county, but in the mountainous districts the soil is poor, the holdings are subdivided beyond the possibility of affording proper sustenance to their occupiers, and, except where fishing is combined with agricultural operations, the circumstances of the peasantry are among the most wretched of any district of Ireland.

In 1881 there were 179,343 acres, or less than one-eighth of the whole area, under crops, while 545,040 were pasture, 10,702 woods, and 521,673 waste.

From 77,508 in 1760 the population gradually increased till in 1841 it was 388,887, but in 1851 it had diminished to 274,499, in 1871 to 246,030, and in 1901 to 202,627, of whom 99,058 were males and 103,569 females.

MAYOR. See **MUNICIPALITY**.

MAYOTTO. See **COMORES**.

MAYSVILLE, the capital of Mason county, Ky., lies on the south bank of the Ohio, sixty-nine miles northeast of Lexington by rail. Settled in 1784 and incorporated in 1833, it has grown into a busy place with public buildings, flour-mills, plow-factories, etc., and is one of the principal hemp-markets in the United States. Population in 1900, 6,423.

MAZAMET, an industrial town in the department of Tarn, France, stands on the northern slope of the Montagnes Noires (part of the Cevennes), and on the Arnette, a tributary of the Tarn by the Agout. In last century it was an insignificant village, but at present it has 14,000 inhabitants, an increase of prosperity due to the introduction of the manufacture of a particu-

lar kind of woolen fabric sold almost exclusively in France.

MAZANDARÁN, a province of northern Persia, lying between the Caspian Sea and the Elbûrz range, and bounded east and west by the provinces of Astrábad and Gilán respectively, is 220 miles in length and 60 miles in (mean) breadth, with an area of about 10,000 square miles and a population estimated at from 150,000 to 200,000.

MAZARIN, JULES, cardinal, the successor of Richelieu, and forerunner of Louis XIV., was the elder son of Pietro Mazarini, the intendant of the house of Philip Colonna, and his wife Ortensia Buffalini, a connection of the Colonnas, and was born at Piscina in Abruzzi on July 14, 1602. He was educated by the Jesuits at Rome till his seventeenth year, when he accompanied Jerome Colonna as chamberlain to the university of Alcalá in Spain. On his return to Rome he took his degree as Doctor Utriusque Juris, and then became captain of infantry in the regiment of Colonna, which took part in the war in the Valtelline. During this war he gave proofs of much diplomatic ability, and Pope Urban VIII. intrusted him, in 1629, with the difficult task of putting an end to the war of the Mantuan succession. His success marked him out for further distinction. He was presented to two canopies in the churches of St. John Lateran and Sta. Maria Maggiore, although he had only taken the minor orders, and had never been consecrated priest; he negotiated the treaty of Turin between France and Savoy in 1632, became vice-legate at Avignon in 1634, and nuncio at the court of France from 1634-36. He accepted Richelieu's offer of entering the service of the king of France, and in 1639 became a naturalized Frenchman. In 1640 Richelieu sent him to Savoy, where the regency of Christine, the duchess of Savoy, and sister of Louis XIII., was disputed by her brothers-in-law, the princes Maurice and Thomas of Savoy, and he succeeded not only in firmly establishing Christine but in winning over the princes of France. This great service was rewarded by his promotion to the rank of cardinal on the presentation of the king of France in December, 1641. On December 4, 1642, Cardinal Richelieu died, and on the next day the king sent a circular letter to the officials ordering them to send in their reports to Cardinal Mazarin, as they had formerly done to Cardinal Richelieu. Mazarin was thus acknowledged supreme minister, but he still had a difficult part to play.

His measures were ably taken, and when the king died on May 14, 1643, to everyone's surprise her husband's minister remained the queen's. The king had by a royal edict cumbered the queen-regent with a council and other restrictions, and it was necessary to get the parliament of Paris to overrule the edict, and make the queen absolute regent, which was done with the greatest complaisance. Now that the queen was all-powerful, it was expected she would at once dismiss Mazarin and summon her own friends to power. Mazarin had inherited the policy of France during the Thirty Years' War from Richelieu. He had inherited his desire for the humiliation of the house of Austria in both its branches, his desire to push the French frontier to the Rhine and maintain a counterpoise of German states against Austria, his alliances with the Netherlands and with Sweden, and his four theaters of war—on the Rhine, in Flanders, in Italy, and in Catalonia. He made one fatal mistake—he dreamt of the French frontier being the Rhine and the Scheldt, and that a Spanish princess might bring the Spanish Netherlands as dowry to Louis XIV. This roused the jealousy of the United Provinces, and they made a separate peace with Spain in January, 1648; but the valor of the French generals

made the skill of the Spanish diplomatists of no avail, for Turenne's victory at Zusmarshausen, and Condé's at Lens, caused the peace of Westphalia to be definitely signed in October, 1648. The origin of both the Frondes was partly Mazarin's fault. As the war progressed, Mazarin had steadily followed Richelieu's policy of weakening the nobles on their country estates. Whenever he had an opportunity he destroyed a feudal castle, and by destroying the towers which commanded nearly every town in France, he freed such towns as Bourges, for instance, from their long practical subjection to the neighboring great lord.

The Fronde over, Mazarin had to build up afresh the power of France at home and abroad. It is to his shame that he did so little at home. Beyond destroying the brick and mortar remains of feudalism, he did nothing for the people. But abroad his policy was everywhere successful, and opened the way for the policy of Louis XIV. He at first, by means of an alliance with Cromwell, recovered the northwestern cities of France, though at the price of yielding Dunkirk to the Protector. On the Baltic, France guaranteed the treaty of Oliva between her old allies Sweden, Poland, and Brandenburg, which preserved her influence in that quarter. In Germany he, through Lionne, formed the league of the Rhine, by which the states along the Rhine bound themselves under the headship of France to be on their guard against the house of Austria. By such measures Spain was induced to sue for peace, which was finally signed in the Isle of Pheasants on the Bidassoa, and which is known as the treaty of the Pyrenees. By it Spain recovered Franche Comté, but ceded to France Roussillon, and much of French Flanders; and, what was of greater ultimate importance to Europe, Louis XIV. was to marry a Spanish princess, who was to renounce her claims to the Spanish succession if her dowry was paid, which Mazarin knew could not happen at present from the emptiness of the Spanish exchequer. He returned to Paris in declining health, and did not long survive the unhealthy sojourn on the Bidassoa; after some political instruction to his young master, he passed away at Vincennes on March 9, 1661, leaving a fortune estimated at from 18,000,000 to 40,000,000 livres behind him, and his nieces married into the great families of France and Italy.

MAZATLAN, a city and seaport of Mexico, in the State of Cinaloa, on the coast of the Pacific, near the mouth of the Gulf of California. A large smuggling trade was formerly carried on in much the same lines as the present legitimate traffic—export of bullion, dye-stuffs, and pearls, and import of manufactured goods from Europe and fruits and vegetables from San Francisco. In 1878 the value of the imports was about \$3,000,000, that of the exports about \$1,500,000. The population, which contains a large floating element, is 15,000.

MAZEPPA, IVAN STEPHANOVITCH, a Cossack chief, best known as the hero of one of Lord Byron's poems, was born in 1644, of a noble family, at Mazepintzui, in the palatinate of Podolia. At an early age he became a page at the court of John Casimir, king of Poland. After some time he returned to his native province; but, engaging in an intrigue with a Polish matron of high rank, he was detected by the injured husband, and was sentenced to be bound naked on the back of an untamed horse. The animal on being let loose galloped off to its native wilds of the Ukraine. Mazeppa half-dead and insensible, was released from his fearful position and restored to animation by some peasants. In a short time his agility, courage, and sagacity rendered him popular among the Cossacks. He was appointed secretary and adjutant to Samoilovitch, their hetman at

chief, and succeeded that functionary in 1687. The title of prince was afterward conferred upon him by his friend and patron, Peter the Great, who long believed confidently in his good faith, and banished or executed as calumnious traitors all who, like Palei, Kotchubey, and Iskra, ventured to accuse him of conspiring with the enemies of Russia. Bent, however, upon casting off the Russian yoke, Mazeppa became, in his seventieth year, and after much hesitation and inconstancy of purpose, an ally of the Swedish monarch, Charles XII. After the disastrous battle of Pultowa, fought, it is said, by his advice, Baturin, his capital, was taken and sacked by Menshikoff, and his name anathematized throughout the churches of Russia, and his effigy suspended from the gallows. A wretched fugitive, he escaped to Bender, but only to end his life by poison in 1709.

MAZZARA DEL VALLO, a city of Italy, on the coast of Sicily, in the province of Trapani, thirteen miles by rail southeast of Marsala. Population about 15,000.

MAZZINI, GIUSEPPE, Italian patriot, was born on June 22, 1805, at Genoa, where his father, Giacomo Mazzini, was a physician in good practice, and a professor in the university. At the age of thirteen he began to attend classes in the faculty of arts at the university; he afterward studied anatomy with a view to following his father's profession, but finally (1826) graduated in laws. For some time after his admission as an advocate Mazzini was occupied in the *Ufficio dei Poveri*; but, although he seems to have discharged the duties arising from this with zeal and success, he never really overcame his repugnance to the dry and technical details of legal practice. The natural bent of his genius was toward literature, and, in the course of the four years of his nominal connection with the legal profession, he wrote a considerable number of essays and reviews, some of which have been wholly or partially reproduced in the critical and literary volumes of his *Life and Writings*. But in the meantime the "republican instincts" which he tells us he had inherited from his mother had been developing, and his sense of the evils under which Italy was groaning had been intensified; and at the same time he became possessed with the idea that Italians, and he himself in particular, "could and therefore ought to struggle for liberty of country." His literary articles accordingly became more and more suggestive of advanced liberalism in politics, and led to the suppression by government of the *Indicatore Genovese* and the *Indicatore Livornese* successively. Having joined the Carbonari, he soon rose to one of the higher grades in their hierarchy, and was entrusted with a special secret mission into Tuscany; but he was betrayed, while initiating a new member, to the authorities of Piedmont. He was imprisoned in the fortress of Savona on the western Riviera for about six months, when, a conviction having been found impracticable, he was released, but upon conditions involving so many restrictions of his liberty that he preferred the alternative of leaving the country. He withdrew accordingly into France, living chiefly in Marseilles. Soon after his release his prison meditations took shape in the programme of the organization which was destined soon to become so famous throughout Europe, that of *La Giovine Italia*, or Young Italy. Its publicly avowed aims were to be the liberation of Italy from both foreign and domestic tyranny, and its unification under a republican form of government; the means to be used were education, and, where advisable, insurrection by guerrilla bands; the motto was to be "God and the people," and the banner was to bear on one side the words "Unity" and "Independence" and on the other "Liberty," "Equality," and "Humanity," to describe

respectively the national and international aims. In April, 1831, Charles Albert, "the ex-Carbonari conspirator of 1821," succeeded Charles Felix on the Sardinian throne, and toward the close of that year Mazzini, making himself, as he afterward confessed, "the interpreter of a hope which he did not share," wrote the new king a letter, published at Marseilles, urging him to take the lead in the impending struggle for Italian independence. Clandestinely reprinted, and rapidly circulated all over Italy, its bold and outspoken words produced a great sensation, but so deep was the offense it gave to the Sardinian Government that orders were issued for the immediate arrest and imprisonment of the author should he attempt to cross the frontier. Toward the end of the same year appeared the important Young Italy "Manifesto;" and this was followed soon afterward by the society's *Journal*, which, smuggled across the Italian frontier, had great success in the objects for which it was written, numerous "congregations" being formed at Genoa, Leghorn, and elsewhere. Representations were consequently made by the Sardinian to the French Government, which issued an order for Mazzini's withdrawal from Marseilles (August, 1832); he lingered for a few months in concealment, but ultimately found it necessary to retire into Switzerland. From this point it is somewhat difficult to follow the career of the mysterious and terrible conspirator who for twenty years out of the next thirty led a life of voluntary imprisonment (as he himself tells us) "within the four walls of a room," and "kept no record of dates, made no biographical notes, and preserved no copies of letters." In 1833, however, he is known to have been concerned in an abortive revolutionary movement which took place in the Sardinian army; several executions took place, and he himself was laid under sentence of death. Before the close of the same year a similar movement in Genoa had been planned, but failed through the youth and inexperience of the leaders. At Geneva, also in 1833, Mazzini set on foot *L'Europe Centrale*, a journal of which one of the main objects was the emancipation of Savoy; but he did not confine himself to a merely literary agitation for this end. Chiefly through his agency a considerable body of German, Polish, and Italian exiles was organized, and an armed invasion of the duchy planned.

The frontier was actually crossed on February 1, 1834, but the attack ignominiously broke down without a shot having been fired. In April, 1834, the "Young Europe" association "of men believing in a future of liberty, equality, and fraternity for all mankind, and desirous of consecrating their thoughts and actions to the realization of that future," was formed, also under the influence of Mazzini's enthusiasm; it was followed soon afterward by a "Young Switzerland" society, having for its leading idea the formation of an Alpine confederation, to include Switzerland, Tyrol, Savoy, and the rest of the Alpine chain as well. But *La Jeune Suisse* newspaper was compelled to stop within a year, and in other respects the affairs of the struggling patriot became embarrassed. He was permitted to remain at Grenchen in Solothurn for a while, but at last the Swiss diet, yielding to strong and persistent pressure from abroad, exiled him about the end of 1836. In January, 1837, he arrived in London, where, for many months, he had to carry on a hard fight with poverty and the sense of spiritual loneliness so touchingly described by himself in the first volume of the *Life and Writings*. Ultimately, as he gained command of the English language, he began to earn a livelihood by writing review articles, some of which have since been reprinted, and are of a high order of literary merit. In 1839 he entered into relations with the revolutionary committees

sitting in Malta and Paris, and in 1840 he originated a workingmen's association, and the weekly journal entitled *Apostolato Popolare*, in which the admirable popular treatise "On the Duties of Man" was commenced.

The most memorable episode in his life during the same period was perhaps that which arose out of the conduct of Sir JAMES GRAHAM (*q.v.*), the home secretary, in systematically opening Mazzini's letters as they passed through the British postoffice, and communicating their contents to the Neapolitan Government—a proceeding which brought about the arrest and execution of the brothers Bandiera, Austrian subjects, who had been planning an expedition against Naples. The prolonged discussions in parliament, and the report of the committee appointed to inquire into the matter, did not, however, lead to any practical result, unless indeed the incidental vindication of Mazzini's character, which had been recklessly assailed in the course of debate. Mazzini did not share the enthusiastic hopes everywhere raised in the ranks of the Liberal party throughout Europe by the first acts of Pius IX., in 1846, but at the same time he availed himself, toward the end of 1847, of the opportunity to publish a letter addressed to the new pope, indicating the nature of the religious and national mission which the Liberals expected him to undertake. The leaders of the revolutionary outbreaks in Milan and Messina, in the beginning of 1848, had long been in secret correspondence with Mazzini; and their action, along with the revolution in Paris, brought him early in the same year to Italy, where he took a great and active interest in the events which dragged Charles Albert into an unprofitable war with Austria; he actually, for a short time, bore arms under Garibaldi immediately before the reoccupation of Milan, but ultimately, after vain attempts to maintain the insurrection in the mountain districts, found it necessary to retire to Lugano. In the beginning of the following year he was nominated a member of the short-lived provisional government of Tuscany formed after the flight of the grand-duke, and almost simultaneously, when Rome had, in consequence of the withdrawal of Pius IX., been proclaimed a republic, he was declared a member of the constituent assembly there. A month afterward, the battle of Novara having again decided against Charles Albert in the brief struggle with Austria, into which he had once more been drawn, Mazzini was appointed a member of the triumvirate, with supreme executive power. The opportunity he now had for showing the administrative and political ability which he was believed to possess was more apparent than real, for the approach of the professedly friendly French troops soon led to hostilities, and resulted in a siege which terminated, toward the end of June, with the assembly's resolution to discontinue the defense, and Mazzini's indignant resignation.

The surrender of the city on June 30th was followed by Mazzini's flight by way of Marseilles into Switzerland, whence he once more found his way to London. Here, in 1850, he became president of the National Italian Committee, and at the same time entered into close relations with Ledru-Rollin and Kossuth. He had a hand in the abortive rising at Mantua in 1852, and again, in February, 1853, a considerable share in the formidable insurrection which broke out at Milan; once more, in 1854, he had gone far with preparations for renewed action when his plans were completely disconcerted by the withdrawal of professed supporters, and by the action of the French and English Governments in sending ships of war to Naples. The year 1857 found him yet once more in Italy, where, for complicity in short-lived *emutes* which took place at Genoa, Leghorn, and Naples, he was again laid under

sentence of death. Undiscouraged in the pursuit of the one great aim of his life by any such incidents as these, he returned to London, where he edited his new journal *Pensiere ed Azione*. In 1865, by way of protest against the still uncanceled sentence of death under which he lay, Mazzini was elected by Messina as delegate to the Italian parliament, but, feeling himself unable to take the oath of allegiance to the monarchy, he never took his seat. In the following year, when a general amnesty was granted after the cession of Venice to Italy, the sentence of death was at last removed, but he declined to accept such an "offer of oblivion and pardon for having loved Italy above all earthly things." In May, 1869, he was again expelled from Switzerland, at the instance of the Italian Government, for having conspired with Garibaldi; after a few months spent in England he set out (1870) for Sicily, but was promptly arrested at sea and carried to Gaeta, where he was imprisoned for two months. For some time his health had been far from satisfactory, but the immediate cause of his death was an attack of pleurisy with which he was seized at Pisa, and which terminated fatally on March 10, 1872.

The Italian parliament by a unanimous vote expressed the national sorrow with which the tidings of his death had been received, the president pronouncing an eloquent eulogy on the departed patriot as a model of disinterestedness and self-denial, and one who had dedicated his whole life ungrudgingly to the cause of his country's freedom. A public funeral took place at Pisa on March 14, and the remains were afterward conveyed to Genoa, where they were interred in the presence of a vast concourse of people.

MAZZOLA. See PARMIGIANO.

MEAD, RICHARD, physician, was born August 11, 1673, at Stepney (near London). He died February 16, 1754.

MEADVILLE, the county seat of Crawford county, Penn., on the left bank of French Creek, a tributary of the Alleghany river, and at the junction of the Franklin branch with the main line of the New York, Pennsylvania and Ohio Railroad, 102 miles from Salamanca. It is a well-built town, maintains a large trade with the oil regions, and has railway and other machine works, glass-works, woolen-mills, and paper-mills. Population (1900), 10,291.

MEASLES, an acute infectious disease occurring mostly in children. It appears to have been known from an early period in the history of medicine, mention being made of it in the writings of Rhazes and others of the Arabian physicians in the tenth century. For long, however, its specific nature was not recognized, and it was held to be a variety of smallpox. After the non-identity of these two diseases had been established, measles and scarlet fever continued to be confounded with each other. It is only within a comparatively recent period that measles has come to be regarded as a distinct and independent malady.

Like the other eruptive fevers, to which class of diseases measles belongs, its progress is marked by several stages more or less sharply defined.

Measles as a disease derives its chief importance in the view of medical men from the risk, by no means slight, of certain complications which are apt to arise during its course, more especially inflammatory affections of the respiratory organs. These are most liable to occur in the colder seasons of the year and in very young and delicate children. Irritation of the respiratory passages is one of the symptoms of measles, but this subsides with the decline of the eruption. Not infrequently, however, these symptoms, instead of abating, become aggravated, and bronchitis of the capillary form (see BRONCHITIS), or pneumonia, generally of the

diffuse or lobular variety (see PNEUMONIA), impart a gravity to the case which it did not originally possess. By far the greater portion of the mortality in measles is due to its complications, of which those just mentioned are the most common, but which also include inflammatory affections of the larynx, with attacks resembling croup, and also diarrhoea assuming a dysenteric character. Or there may remain as direct results of the disease chronic ophthalmia, or discharge from the ears, with deafness, and occasionally a form of gangrene affecting the tissues of the mouth or cheeks and other parts of the body, leading to disfigurement and even endangering life.

Apart, however, from those immediate risks, it deserves to be borne in mind that in measles there appears to be a tendency in many cases for the disease to leave behind a weakened and vulnerable condition of the general health, which may render children, previously robust, delicate, and liable to chest complaints, and is, in not a few instances, the precursor of some of those tubercular affections to which the period of childhood and youth is liable.

These various effects or sequelæ of measles plainly indicate that although in itself a comparatively mild ailment, it cannot safely be regarded with indifference. Indeed it is doubtful whether any other disease of early life demands more careful watching as to its influence on the health. Happily, many of those attending evils now alluded to may by proper management be averted.

Measles is a disease of the earlier years of childhood. Like other infectious maladies, it is admittedly rare, though not unknown, in nurslings or infants under six months old. It is comparatively seldom met with in adults, but this is simply due to the fact that most persons have undergone an attack in early life, since, where this has not been the case, the old suffer equally with the young.

The treatment of measles embraces the preventive measures to be adopted in the case of an outbreak by the isolation of the sick at as early a period as possible. Epidemics have often, especially in limited localities, been curtailed by such a precaution. In families with little house accommodation this measure is frequently, for the reason already referred to regarding the communicable period of the disease, ineffectual; nevertheless where practicable it ought to be tried, for it is a grave error needlessly to expose the healthy children in a family to the risk of infection under the idea that they must necessarily take the disease at some time or other. The unaffected children should likewise be kept from school for a time (probably about three weeks from the outbreak in the family would suffice if no other case occur in the interval), and all clothing in contact with the patient should be subjected to disinfection or thorough washing. In extensive epidemics it is often desirable to close the schools of a locality for a time. As regards special treatment, in an ordinary case of measles little is required beyond what is necessary in febrile conditions generally. Confinement to bed in a somewhat darkened room, into which, however, air is freely admitted in such a manner as to avoid the risk of draughts, light nourishing liquid diet (soups, milk, etc.), and mild diaphoretic remedies, such as the acetate of ammonia or ipecacuanha, are all that is necessary in the febrile stage. When the catarrhal symptoms are very severe, the hot bath or warm packing to the body generally or the chest and throat afford relief, and the same measures may with advantage be adopted should the eruption be but feebly developed or tend to recede, and especially should convulsions set in. The serious chest complications of measles are to be dealt with by those measures applicable for the relief of the particular symp-

oms (see BRONCHITIS, PNEUMONIA). The inhalation of vapor and the use of the preparations of ammonia are of special efficacy. Diarrhoea is treated by the usual remedies, including carefully administered doses of Dover's powder, chalk, etc. During convalescence the patient must be guarded from exposure to cold, and for a time after recovery the state of the health ought to be watched with the view of averting the evils, both local and constitutional, which but too often follow this disease.

German Measles (Rötheln, or Epidemic Roseola) is a term applied to a contagious eruptive disorder having certain points of resemblance to measles, and, according to some observers, also to scarlet fever, but exhibiting its distinct individuality in the fact that it protects from neither of these diseases. It occurs most commonly in children, and is occasionally seen in extensive epidemics. Beyond confinement to the house in the eruptive stage, which, from the slight symptoms experienced, is often difficult of accomplishment, no especial treatment is called for. There is little doubt that the disease is often mistaken for true measles, and many of the alleged second attacks of the latter malady are probably cases of rötheln.

MEASUREMENT. Every system of geometrical measurement, as indeed the whole science of geometry itself, is founded on the possibility of transferring a fixed figure from one part of space to another with unchanged form.

Magnitudes which have only one dimension present the theory of measurement in its simplest form. The length of a straight line may be taken as an illustration of a one-dimensioned magnitude. The velocity of a moving particle, the temperature of a heated body, the electric resistance of a metal, all these and many others are instances of one-dimensioned magnitude, the measure of which is to be expressed by a single quantity. But there may be magnitudes which require more than a single measurement for their complete specification. Take, for instance, a four-sided field which has been duly surveyed. Of what is the measurement of this field to consist? If the number of acres in the field be all that is required, then the area is expressed by a simple reference to a number of standard acres. If, however, the entire circumstances of the field are to be brought into view, then a simple statement of the area is not sufficient. It can be easily shown that the surveyor must ascertain five independent quantities before the details of the shape of the field can be adequately defined. Four of these quantities may naturally be the lengths of the four sides of the field, the fifth may be one of the angles, or the area, or the length of one of the diagonals. Speaking generally, we may say that five distinct measurements will be necessary to define the field adequately. The actual choice of the particular measurements to be made is to a great extent arbitrary. The only condition absolutely necessary is that they shall be all independent and free from ambiguity. Once these five quantities are ascertained then all the other features of the figure are absolutely determined. For instance, the four sides and the diagonal being ascertained by measurement, then the other diagonal, the four angles, and the area can all be computed by calculation. The five quantities would determine everything about the field except its actual position on the surface of the earth. If we further desired to have the field exactly localized certain other quantities must be added. The latitude and the longitude of one specified corner of the field would completely indicate that corner, while the azimuth of one side from that corner would complete the definition of its position. We are thus led to see that for the complete delineation of every circumstance relating to the shape of the field and its locality eight different measure-

ments have been required. Two sets of eight measurements differing in any particular can never indicate the same field. It is very important to notice that the number of quantities required is quite independent of the particular nature of the measurements adopted. We might, for instance, have simply measured the latitude and the longitude of each of the four corners of the field. Once these quantities are known, then the shape of the field, its area, its angles, and its diagonals have all been implicitly determined. Here again we see that as two quantities are required to localize each of the four corners, so eight quantities will be required to fully determine the whole field.

In the operations of analytical geometry we are accustomed to specify the position of a point by the relation which it bears to certain fixed axes. By means of certain quantities, either altogether linear or partly linear and partly angular, we are enabled to specify the position of the point with absolute definiteness. These quantities are called the coördinates of the point. In a similar though more extended sense we may use the word "coördinates" to express the group of eight magnitudes which we have found to be adequate to the complete specification of the field. By the measurement of the field in the most complete sense of the term we mean the measurement of its eight coördinates.

Most of the quantities for which measurements are needed can be ultimately expressed by means of (1) a definite length, (2) a definite mass, or (3) a definite interval of time.

It is very important that the units thus referred to should be chosen judiciously, and it must be admitted that the units ordinarily used do not fulfill the conditions which a well-chosen system of units should fulfill. The most scientific system is beyond doubt that which has been suggested by the units committee of the British Association. In this system the unit of length is the *centimeter*, the unit of mass is the *gramme*, and the unit of time is the *second*, and the system is therefore often referred to for brevity as the C.G.S. system. The unit of force is termed the *dynes*, and it is defined to be the force which, acting upon a gramme of matter for a second, generates a velocity of a centimeter per second. The unit of work is the work done by this force working through a centimeter, and this unit is termed the *erg*. The unit of power is the power of doing work at the rate of one erg per second, and the power of an engine can be specified in ergs per second. By the prefixes deca, hecto, kilo, mega, we can express a magnitude equal to the unit multiplied by 10, 100, 1,000, or 1,000,000 respectively. On the other hand the prefixes deci, centi, milli, micro, signify the units divided by 10, 100, 1,000, or 1,000,000 respectively.

For comparison with the ordinary units the following statement will be useful. The weight of a gramme at any part of the earth's surface is about 980 dynes, or rather less than a kilodyne. The weight of a kilogramme is rather less than a megadyne, being 980,000 dynes.

MEATH, a maritime county of Ireland, in the province of Leinster, is bounded east by the Irish Sea, southeast by Dublin, south by Kildare and King's county, west by Westmeath, northwest by Cavan and Monaghan, and northeast by Louth. Its greatest length north and south is about forty miles, and its breadth east and west about forty-five miles. The total area comprises 578,560 acres, or about 906 square miles. Population (1901), 67,463.

MEAUX, capital of an *arrondissement*, and an episcopal see, in the department of Seine-et-Marne, France, and formerly chief town of Haute Brie, is situated twenty-eight miles east of Paris, on the Marne,

which runs through the town, and on the Paris and Strasburg Railway.

MECCA (*Makka*), the chief town of the Hijáz in Arabia, and the great holy city of Islám, is situated two camel marches (the resting-place being Bahra or Hadda in the Batn Marr), or about forty-five miles, almost due east, from Jidda, on the Red Sea.

It is said in the Koran that Mecca lies in a sterile valley, and the old geographers observe that the whole Haram or sacred territory round the city is almost absolutely without cultivation or date palms, while fruit-trees, springs, wells, gardens, and green valleys are found immediately beyond. Mecca in fact lies in the heart of a mass of rough hills, intersected by a labyrinth of narrow valleys and passes, and projecting into the Tiháma or low country on the Red Sea, in front of the great mountain wall that divides the coast lands from the central plateau, though in turn they are themselves separated from the sea by a second curtain of hills forming the western wall of the great Wády Marr.

Holding this position, and situated in a narrow and barren valley quite incapable of supporting an urban population, Mecca must have been from the first a commercial town. In the palmy days of South Arabia it was probably a station on the great incense route, and thus Ptolemy may have learned the name, which he writes Makoraba. At all events, long before Mohammed we find Mecca established in the twofold quality of a commercial center and a privileged holy place, surrounded by an inviolable territory (the Haram), which was not the sanctuary of a single tribe but a place of pilgrimage, where religious observances were associated with a series of annual fairs at different points in the vicinity.

The victory of Mohammedanism made a vast change in the position of Mecca. The merchant aristocracy became satraps or pensioners of a great empire; but the seat of dominion was removed beyond the desert, and though Mecca and the Hijáz strove for a time to maintain political as well as religious predominance, as will be related under MOHAMMEDAN EMPIRE, the struggle was vain, and terminated on the death of Ibn Zubeyr, the Meccan pretendant to the caliphate, when the city was taken by Hajjáj, (692 A.D.). On the other hand, the sanctuary and feast of Mecca received a new prestige from the victory of Islám. Purged of elements obviously heathenish, the Ka'ba (Caaba) became the holiest site, and the pilgrimage the most sacred ritual observance of Mohammedanism, drawing worshipers from so wide a circle that the confluence of the petty traders of the desert was no longer the main feature of the holy season. To this day the Meccans live by the Hajj—letting rooms, acting as guides and directors in the sacred ceremonies, as contractors and touts for land and sea transport, as well as exploiting for their own advantage the many benefactions that flow to the holy city; while the surrounding Bedouins derive a chief part of their support from the camel-transport it demands and from the subsidies and gifts by which they are engaged to protect or abstain from molesting the pilgrim caravans.

The fixed population of Mecca in 1900 was estimated by Assistant-Surgeon Abd el-Razzák at 58,000 to 60,000; but the materials for an estimate are very inadequate where there is so large a floating population, and that not merely at the proper season of pilgrimage, the pilgrims of one season often beginning to arrive before those of the former season have all dispersed. At the height of the season the town is much overcrowded, and the entire want of a drainage system is severely felt. Fortunately good water is tolerably plentiful; for, though the wells are mostly undrinkable, and even the

Amous Zamzam water very unwholesome and tainted with sewage, the underground conduit from beyond 'Arafa, completed by Sultan Selim II. in 1571, supplies to the public fountains a sweet and light water, containing, according to 'Abd el-Razzák, a large amount of chlorides. The water is said to be free to townsmen, but is sold to the pilgrims at a rather high rate.

Mediæval writers celebrate the copious supplies, especially of fine fruits, brought to the city from Táif and other fertile parts of Arabia. These fruits are still famous; rice and other foreign products are brought by sea to Jidda; mutton is plentifully supplied from the desert. The industries of Mecca all center in the pilgrimage; the chief object of every Meccan—from the notables and sheikhs, who use their influence to gain custom for the Jidda speculators in the pilgrim traffic, down to the cicerones, pilgrim brokers, lodging-house keepers, and semi-mendicant hangers-on at the holy places—being to pillage the visitor in every possible way. Thus the fanaticism of the Meccan is an affair of the purse; the mongrel population (for the town is by no means purely Arab) has exchanged the virtues of the Bedouin for the worst corruptions of Eastern town life, without casting off the ferocity of the desert, and it is hardly possible to find a worse certificate of character than the three parallel gashes on each cheek, called Tashrit, which are the customary mark of birth in the holy city. The unspeakable vices of Mecca are a scandal to all Islám, and a constant source of wonder to pious pilgrims.

Long before Mohammed the chief sanctuary of Mecca was the Ka'ba, a rude stone building, so named from its resemblance to a monstrous *astragalus* or die, of about forty feet cube, though the shapeless mass is not really an exact cube or even exactly rectangular. The Ka'ba has been rebuilt more than once since Mohammed purged it of idols and adopted it as the chief sanctuary of Islám, but the old form has been preserved except in secondary details; so that the "Ancient House," as it is titled, is still essentially a heathen temple, adapted to the worship of Islám by the clumsy fiction that it was built by Abraham and Ishmael by divine revelation as a temple of pure monotheism, and that it was only temporarily perverted to idol worship from the time when 'Amr ibn Lohay introduced the statue of Hobal from Syria till the victory of Islám. The black stone is a small, dark mass a span long, with an aspect suggesting volcanic or meteoric origin, fixed at such a height that it can be conveniently kissed by a person of middle size. It was broken by fire in the siege of 683 A.D., and the pieces are kept together by a silver setting. The history of this heavenly stone, given by Gabriel to Abraham, does not conceal the fact that it was originally a fetish, the most venerated of a multitude of idols and sacred stones which stood all round the sanctuary in the time of Mohammed. The Prophet destroyed the idols, but he left the characteristic form of worship—the *tawáf*, or sevenfold circuit of the sanctuary, the worshiper kissing or touching the objects of his veneration—and besides the black stone he recognized the so-called "southern" stone, the same, presumably, with that which is still touched in the tawáf at the Yemen corner. The ceremony of the tawáf and the worship of stone fetishes was common to Mecca with other ancient Arabian sanctuaries. Islám did away with the worship of idols; what was lost in interest by their suppression has been supplied by the invention of spots consecrated by recollections of Abraham, Ishmael, and Hagar, or held to be acceptable places of prayer.

The feeling of religious conservatism which has preserved the structural rudeness of the Ka'ba through so many centuries did not interfere with the adoption of

costly surface decoration. In Mohammed's time the outer walls were covered by a veil (or *kiswa*) of striped Yemen cloth. The magnificence of the caliphs substituted a covering of figured brocade, and the sultan still sends with each pilgrim caravan from Cairo a new *kiswa* of black brocade, adorned with a broad band embroidered with golden inscriptions from the Koran, as well as a richer curtain for the door.

The interior of the Ka'ba is now opened but a few times every year; there is a great scramble for admission—the portable staircase being seldom brought forward—and a great clamor for backshish; thus the modern descriptions, from observations made under difficulties, are not very complete.

After the Ka'ba the principal points of interest in the mosque are the well Zamzam and the Makám Ibráhm. The former is a deep shaft inclosed in a massive vaulted building paved with marble, and, according to Mohammedan tradition, is the source from which Hagar drew water for her son Ishmael.

MECHANICS. Strictly speaking, the derivation of this word should have prevented the use of it as the designation of a pure science. It has been, however, employed for a long period in English speech in the identical sense that the French attach to *Mécanique pure* or the Germans to *Reine Mechanik*. These terms are all employed to denote what we should much prefer to call *Abstract Dynamics*—the pure science which (as the derivation implies) treats of the action of Force upon Matter, but which is, correctly, the *Science of Matter and Motion*, or of *Matter and Energy*.

With the view of making clear from the outset the reason for the arrangement adopted in this article, we commence by stating Newton's *Axiomata, sive. Leges Motus*, which form the entire basis of our subject. These laws will at once indicate the order in which the subject may most logically be treated.

Newton's Laws of Motion.

§ 1. I. Every body continues in its state of rest, or of uniform motion, in a straight line, except in so far as it is compelled by force to change that state.

II. Change of (quantity of) motion is proportional to force, and takes place in the straight line in which the force acts.

III. To every action there is always an equal and contrary reaction; or the mutual actions of any two bodies are always equal and oppositely directed.

§ 2. These laws are to be considered as deductions from observation and experiment, and in no sense as having an *a priori* foundation. Their proof, so far as rigorous proof is attainable in physical matters, is commonly looked on as being furnished in the most conclusive form by observational astronomy. The *Nautical Almanac*, published usually about four years in advance, contains the predicted places of the sun, moon, and principal planets from day to day, in some cases from hour to hour, throughout the year. The predictions are entirely based upon the laws of motion (along with the law of gravitation), and could not possibly be accurate unless these laws are true. So thoroughly satisfactory has hitherto been the coincidence between prediction and observation that, when a deviation occurs, no one dreams of a defect in the principles of the reasoning. On the contrary, such deviations are utilized for the purpose of correcting our knowledge of the "elements" of the orbits of the moon and planets, or our estimates of the masses of these bodies; and, as in the brilliant investigations of Adams and Leverrier, they sometimes enable us to discover the existence and even assign the position of a planet never before seen.

§ 3. It is not clear in what order, or by whom, these

laws were first discovered. Galileo was undoubtedly acquainted with the first two; and Huygens, Wren, Hooke, and others were acquainted with the Third Law in some of its many applications. But they were first systematized, and, as we have seen, extended in a most important manner by Newton. Though they were sadly disfigured in Britain during the fifty years which elapsed after the revival of mathematics in the early part of this century, they have of late been restored to the form in which Newton gave them. This re-adoption of Newton's simple but comprehensive system has of itself aided in no small degree the recent rapid advance of science.

Comments on the Laws of Motion.

§ 4. Law I. First of all this law tells us what happens to a piece of matter which is left to itself, *i.e.*, not acted on by forces. It preserves its "state," whether of rest or of uniform motion in a straight line. This property is commonly called the "inertia" of matter, in virtue of which it is incapable of varying in any way its state of rest or motion. It may be the sport of forces for any length of time, but so soon as they cease to act it remains in the state in which it was left until they recommence their action on it. Hence, whenever we find the state of a piece of matter changing, we conclude that it is under the action of a force or forces. Thus, for the present, we have the definition of "force" as part of this First Law:

Force is whatever changes the state of rest or uniform motion of a body.

When a body originally at rest begins to move, we conclude that force is acting on it. And when a moving body is seen to change *either* the speed *or* the direction of its motion, we conclude that this is due to force.

§ 5. But there is much more than this, even in the First Law. What is "rest?" The answer must be that the term is relative. Absolute rest and absolute motion are terms to which we find it impossible to assign a meaning. Maxwell has well said (in his *Matter and Motion*):

"All our knowledge, both of time and place, is essentially relative. When a man has acquired the habit of putting words together, without troubling himself to form the thoughts which ought to correspond to them, it is easy for him to frame an antithesis between this relative knowledge and a so-called absolute knowledge, and to point out our ignorance of the absolute position of a point as an instance of the limitation of our faculties. Anyone, however, who will try to imagine the state of a mind conscious of knowing the absolute position of a point will ever after be content with our relative knowledge."

As will be seen later, the First Law gives us also a physical definition of "time," and physical modes of measuring it.

§ 6. Law II. What Newton designates by the word *motion* is, as he has clearly pointed out, the same as is expressed by *quantity of motion*, that for which we now usually employ the term "momentum." Its numerical value depends not only on the rate of motion, but also on the amount of matter, or "mass," of the moving body, and is directly proportional to either of these when the other is unaltered. But it is regarded by Newton as having direction as well as magnitude. It is, in fact, what in the language of quaternions is called a "vector." The change of such a quantity may be either in numerical magnitude, or in direction, alone, or simultaneously in both. We now see what this Second Law enables us to do. For

(a) Given the mass of a body, the force acting on it, and the time during which it acts, we can calculate the

change of motion. This is the direct problem of dynamics of a particle.

(b) Given the mass, and the change of velocity, we can calculate the magnitude and direction of the force acting. This is the *inverse* problem.

(c) We can compare, and so measure, forces by the changes of motion they produce in one and the same body.

(d) We can compare the masses of different bodies by finding what changes of velocity one and the same force produces in them.

(e) We can find the *one* force which is equivalent, in its action, to any given set of forces. For, however many changes of motion may be produced by the separate forces, they must obviously be capable of being compounded into a single change, and we can calculate what force would produce that.

§ 7. Hitherto we have spoken of *the* motion of a body—thus implying that all its parts are moving in exactly the same way. From this point of view, every body, however large, may be treated as if it were a single particle. But when the parts of a body have different velocities, as when a rigid body is rotating, or as when a non-rigid body is suffering a change of form, the question becomes much more complex. We cannot enter into a full explanation, but will take a couple of very simple cases to show the nature of the new difficulties, and thence the necessity for an additional law.

Suppose a bullet to be thrown in any direction. If we know with what force the earth attracts it, the calculation of the path it will pursue depends on the Second Law, which gives all the necessary preliminary information. But let two bullets be tied together by a string; we know by trial that each moves, in general, in a manner very different from that in which it would move if free. The path of each is now, usually, a tortuous curve, while its free path would be plane. It is no longer subject to gravity alone, but also to what is called the "tension" of the string. If we knew the amount of this tension on either of the bullets and its direction, we could calculate, by the help of the Second Law alone, all the circumstances of the motion of that bullet. But how are we to find this tension? Is it even the same for each bullet? This, if answered in the affirmative, would simplify matters considerably, but we should still require to know the amount and direction of the tension. It is clear that, without a further axiom, we cannot advance to a solution of the question.

§ 8. Law III. Furnished with this, in addition to our previous information, we can attack the question with more hope. We see by this law that, whatever force be exerted by the string on one of the bullets, an equal and opposite force, which must therefore be in the direction of the string, is exerted on the other. Still, the magnitude of these equal forces remains to be found. But the string in no way interferes with the motion of either bullet *unless it is tight, i.e.*, unless the distance between the bullets is equal to the length of the string. Hence, whenever the unknown force comes into play, at the same time there comes in a geometrical relation of relative position between the two bullets. *This supplies the additional equation necessary for the determination of the new unknown quantity.*

§ 9. As an additional illustration, suppose the string to be made of india-rubber. The Third Law tells us that the tensions it exerts on the bullets are still equal and opposite. But we no longer have the geometrical condition we had before. We have, however, what is quite sufficient, a knowledge of *how the tension of the string depends on its length*. Thus the tension can be calculated from the relative position of the bullets.

§ 10. What has now been said enables us to see the order in which the fundamental ideas should be taken up, so that the necessities of each should be provided for before its turn comes. An indispensable preliminary is the study of motion in the abstract, *i.e.*, without any reference to *what is moving*. This is demanded in order that we may be able to apply the Second Law. The science of pure motion, without reference to matter or force, is an extension of geometry by the introduction of the idea of time and the consequent idea of velocity. Ampère suggested for it the term *Cinématique*, or, as we shall write it, *Kinematics*. We include under it all changes of form and grouping which can occur in geometrical figures or in groups of points.

We shall then be prepared to deal with the action of force on a single particle of matter, or on a body which may be treated as if it were a mere particle. Thus we have the Dynamics of a Particle. This, again, splits into two heads, Statics and Kinetics of a particle. But all this requires the Second Law only. When we have two or more connected particles, or two particles attracting one another or impinging on one another, the Third Law is required. Next in order of simplicity come the Statics and Kinetics of a Rigid Solid. Then we have to deal with bodies whose form, etc., are altered by forces—flexible bodies, elastic solids, fluids, etc. Finally come the general principles, such as “conservation of energy,” “least action,” etc., which are deducible by proper mathematical methods from Newton's Laws, and of which some at least, if we could more clearly realize their intrinsic nature, would probably be found to express even more simply than do Newton's Laws the true fundamental principles of abstract dynamics.

MECHITHARISTS, a congregation of Armenian monks, in communion with the church of Rome, which has enjoyed papal recognition since 1712. Its founder was Mechithar, or Mechitar da Pietro, a native of Sebaste (Sivas) in Armenia, born on February 7, 1676; its rule resembles the Benedictine, prominent among the duties of its members being the proclamation of the gospel and the diffusion of good literature.

MECHLIN, or **MALINES**, a city of Belgium, in the province of Antwerp, on the river Dyle, about fourteen miles north of Brussels. The general aspect of the town, belted by a fine avenue of trees, with well-built houses, extensive gardens, and broad, airy streets and squares of proverbial cleanliness, is pleasing to the eye; there is, however, a lack of life and motion, a repose bordering on stagnation, and the area occupied by the town is much too extensive for the population. Mechlin was for many centuries, and is to this day, the religious metropolis of Flanders, and its monuments and curiosities; are in general of a sacred description. The population of Mechlin in 1901 was 56,013.

MECKLENBURG, a territory in North Germany, on the Baltic Sea, corresponds with tolerable closeness to the old lower Saxon province of the same name, and is now unequally divided into the two grand-duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz. These are so closely related in history, political organization, natural features, and general development that it is convenient to treat them in a single article.

MECKLENBURG-SCHWERIN, the seventh state of the German empire in size and the eighth in population, is bounded on the north by the Baltic Sea, on the west by the principality of Ratzeburg and Lauenburg, on the south by Brandenburg and Hanover, and on the east by Pomerania and Mecklenburg-Strelitz. It embraces the duchies of Schwerin and Güstrow, the district of Rostock, the principality of Schwerin, and the barony of Wismar, besides several small “enclaves” in the adja-

cent territories. Its total area is about 5,135 square miles. Pop. (1900), 607,835.

MECKLENBURG-STRELITZ, the eleventh state of the German empire in area and the nineteenth in population, consists of two detached parts, the duchy of Strelitz on the east of Mecklenburg-Schwerin, and the principality of Ratzeburg on the west. The first of these is bounded by Mecklenburg-Schwerin, Pomerania, and Brandenburg, the second by Mecklenburg-Schwerin, Lauenburg, and the territory of the free town of Lübeck. Their joint area is 1,131 square miles; pop. (1900), 102,628.

Mecklenburg-Schwerin and Mecklenburg-Strelitz are both limited monarchies under grand-dukes, who are hereditary in the male line. The reigning families are closely related, and possess mutual rights of succession; should both families become extinct, their possessions pass to Prussia. The constitution, which is common to both the duchies, exhibits few traces of the liberal tendency of modern politics.

MEDALS. See **NUMISMATICS**.

MEDEA, the daughter of Æetes, king of the Colchians. Medea was one of the “wise women” (witches or sorceresses) of antiquity, and perhaps, like Helen, was a human embodiment of some goddess connected with Eastern element-worship, possibly with Hera. For the story of her love for Jason the Argonaut, and of the revenge she took for his desertion of her for another bride, a Corinthian princess, Glauce, daughter of Creon, see **ARGONAUTS** and **JASON**.

MEDELLIN, a town of Colombia, South America, capital of the state of Antioquia, is situated at a height of 4,845 feet above the sea, in the valley of the Rio Porc, a right-hand tributary of the Rio Cauca. Though the population in 1890 was 40,000, there is no great activity except on the market days, twice a week, when the buyers and sellers flock in from the country.

MEDFORD, a town in the United States, in Middlesex county, Mass., at the head of navigation on Mystic river, and five miles northwest of Boston by a branch of the Boston and Maine Railroad. It is a busy place, with a considerable variety of manufactures—woolens, carpets, buttons, bricks, leather, etc. Tufts College, situated near the town, on Walnut Hill, was founded by the Universalists in 1853, and named in honor of Charles Tufts, the donor of the seventy acres occupied by the building and its grounds. The endowment amounts to more than \$1,000,000. The population of Medford was 18,244 in 1900.

MEDHURST, **WALTER HENRY**, one of the most distinguished Protestant missionaries to the Chinese, was born in London in 1796, and died in 1857.

MEDIA. See **PERSIA**.

MEDICAL JURISPRUDENCE, or, as it is now more usually termed, **FORENSIC MEDICINE**, is that branch of state medicine which treats of the application of medical knowledge to the purposes of the law. The term medical jurisprudence, though sanctioned by long usage, is not an appropriate one; since the subject is, strictly speaking, a branch of medicine rather than of jurisprudence; it does not properly include sanitation or **HYGIENE** (*q.v.*), both this and medical jurisprudence proper being distinct branches of state medicine. The connection between medicine and the law was perceived long before medical jurisprudence was recognized, or had obtained a distinct appellation. It first took its rise in Germany, and subsequently, but more tardily, received recognition in Great Britain and America.

Forensic medicine, or medical jurisprudence proper as distinguished from hygiene, embraces all those questions which bring the medical man into contact with the law, and embraces (1) questions affecting the civil rights

of individuals, and (2) injuries to the person. Some of the aspects of medical jurisprudence, as here treated, refer exclusively to England, but the main text is applicable to the United States, the laws of which are founded in most respects on English custom and law.

1. QUESTIONS AFFECTING THE CIVIL OR SOCIAL RIGHTS OF INDIVIDUALS.

1 Development of the Human Frame.—The development of the physical and mental powers of the human being is a matter of the highest importance, and is a factor of great consequence in determining criminal responsibility, civil responsibility, or the power of giving validity to civil contracts, and in determining the personal identity of a living person or of a corpse. Human life is usually divided into the five periods of *infancy, childhood, youth, manhood, and old age*. Some writers increase the number of these, unnecessarily, to seven periods, without any practical advantage.

Infancy is the period from birth till the first or milk set of teeth begin to be shed—usually about the seventh year. During this period the body increases in size and stature more, relatively, than at any other period of existence; and the mental faculties undergo great development. The milk-teeth, twenty in number, are evolved in a definite order, beginning with the central incisors at about six months, and ending with the second molars about the termination of the second year. From the size and stature of the body, the development of the teeth, and the more or less advanced state of ossification or solidification of the bony skeleton, conclusions may be drawn as to the probable age of the infant.

Childhood extends from the commencement of the shedding of the milk teeth to the age of puberty—usually from the seventh to the fourteenth or fifteenth year. During this period the body expands, as well as the bony structures, without any clearly marked difference in structure being observable between the sexes except as regards the genitals, so that it is impossible to distinguish absolutely between the male and the female skeleton during this period. The milk-teeth are shed, and are replaced by the second or permanent set, thirty-two in number, though these do not usually all make their appearance during childhood. Marked differences between the proclivities of the sexes are noticeable even at an early period of childhood, and long before the characteristic functions begin to be developed.

Youth is marked at its commencement by the changes which occur at puberty—the development of the genitals in both sexes, the appearance of hair on the genitals, the appearance of a beard in the male, the development of the breasts in the female, the appearance of the monthly flow in the female, and the ability to secrete semen in the male. Marked mental changes now occur, and the generative functions are perfected. Youth terminates at the age of legal majority, twenty-one years; or perhaps the period ought to be extended to twenty-five years of age, as it is with some nations.

Manhood (or Womanhood) is the period of perfection of all the bodily and mental powers. It ceases in woman with the cessation of the monthly flow at about forty-five years of age; but in man it generally extends to a much later period of life.

Old Age begins with the decay of the bodily and mental faculties, and is characterized by wrinkling of the skin, loss of the teeth, whitening of the hair, and feebleness of the limbs. In its later stages decay of the mental faculties, deafness, obscurity or loss of vision, and bowing of the spine are added.

2. Duration of Human Life.—The chances of human life form an important subject of inquiry, which has been elucidated by the labors of Price, Milne, Farr, and

others; and on deductions from comparisons of birth and death rates is founded the system of annuities, insurance against loss in sickness, and the insurance of lives. Since the establishment of compulsory registration of deaths, our knowledge of the ordinary and extraordinary chances of human life has been much extended, and surer data are now available for calculations of probabilities of life, of survivorships, and of the payments which ought to be made in benefit clubs. (See INSURANCE and LONGEVITY.)

3. Personal Identity.—It might be imagined that there is little danger, with the exercise of ordinary care, of mistaking one person for another; but the remarkable case of the Tichborne claimant, and some other less-known but perhaps equally singular instances, have demonstrated that mistakes as to the identity of individuals are easily made, and are more frequent than is commonly supposed. Where the identity has to be established or disproved after long absence, exposure to foreign climates and great hardships, wounds, etc., the problem is often one of extreme difficulty. The data for identifying a person are individual and family likeness, stature, the color of the eyes, peculiarities of garb and manner, recollection of antecedent events, but more especially marks on the person either congenital or acquired. Such are *navi* or mother's marks, scars, and disunited or badly united fractures, known to have existed upon the missing person. An accurate solution of the question is, nevertheless, often a matter of the greatest difficulty.

4. Marriage.—Under this head the medical jurist has to deal principally with the nubile age, viewed in the light of nature and according to legislative enactments, and with such physical circumstances as affect the legality of marriages, or justify divorce.

In colder countries the age at which the sexes are first capable of propagating the species is later than in more southern climes. Ordinarily it does not occur before fifteen years of age for the male and fourteen for the female; exceptionally, however, it occurs at the ages of thirteen and of twelve (or even less) respectively in the male and female. By legislative enactment, nevertheless, parents and guardians may forbid the marriage of younger people till the age of legal majority. The only physical circumstances which in the United States form a bar to marriage are physical inability to consummate, and the insanity of one of the parties at the time of marriage. Both those circumstances have been pleaded and sustained in the law courts. In other countries minor physical circumstances, as disease, are held to invalidate marriage.

5. Impotence and Sterility.—These may arise from organic or from functional causes—organic impotence being alone irremediable, and as such taken cognizance of by the law courts. On this subject it is unnecessary to enlarge here.

6. Pregnancy.—This subject presents one of the widest fields for medico-legal evidence. The limits of age between which it is possible, the limits of uterogestation, and the signs of pregnancy may all in turn be the subjects of investigation.

The limits of age between which pregnancy is possible are usually fixed by the appearance and cessation of the monthly flow; and these ordinarily begin about fourteen and cease at forty-five years of age. Exceptionally they appear as early as the tenth year, and may not cease till the end of the fifth decade of life. Cases, however, have occurred where a woman has conceived before menstruating; and a few doubtful cases of conception are recorded in women upward of fifty, or even sixty years of age. The general fact of pregnancy being limited by the age of puberty on the one hand and the

recession of the monthly flow—or fifty years as the extreme limit of age—must be accepted as the safest guide in practice.

The limits of utero-gestation are not in the United States or in England fixed by legislation. The French code fixes the extreme limit of three hundred days. The ordinary period is forty weeks and a half, or two hundred and eighty-three days from the cessation of the last monthly flux. The limit of three hundred days, as fixed by the French code, is perhaps never exceeded, if ever reached. The uncertainty of females in fixing the exact date of conception has given rise to the discrepant opinions of physiologists on the subject. It is well known, however, that among the higher animals the period is not a precise one; and impregnation and conception are doubtless not necessarily coincident.

The signs of pregnancy are of the utmost importance to the medical jurist. He may be called upon to pronounce upon the virtue of a female, to sustain or rebut a plea for divorce, to determine whether a capital sentence shall be carried out, or to determine whether it is probable that an heir will be born to an estate. Should he err in his judgment—and mistakes are very possible in the earlier months of utero-gestation—he may commit a grievous wrong. Medical jurists are in the habit of classifying the signs of pregnancy as uncertain or certain; it is the former which are most regarded by the public, but the latter are alone of probative value to the jurist. The usual and uncertain signs are the cessation of the monthly flow, nausea, sickness, a darkening of the areola and the formation of a secondary areola around the nipple, enlargement of the breasts, increased size of the abdomen, the formation of a tumor in the womb, quickening, and the motions of the fetus. There are also other minor signs of less importance. The certain signs are the uterine souffle, which is a peculiar soft sound heard over the abdomen, and synchronous with the maternal pulse; ballottement, or the examination for a floating tumor in the abdomen between the fifth and eighth months of pregnancy; and the pulsations of the fetal heart, heard by means of the stethoscope. These pulsations are much quicker than, and not synchronous with, the maternal pulse. This is the only indubitable sign of pregnancy. It is inapplicable before the fourth month of gestation.

7. *Parturition.*—The imminence of the process of parturition is of comparatively little interest to the medical jurist; but the signs of recent delivery are all-important. These signs are the bruised, swollen, and lacerated state of the external genitals, relaxation and dilatation of the vagina and womb, the existence of a peculiar vaginal discharge known as the lochia, a relaxed and fissured condition of the abdominal walls, a peculiar aspect of the countenance, and the distended state of the breasts due to the secretion of milk. The lochial discharge is the most characteristic sign. All the signs may disappear within ten days of delivery, though this is not usual.

Connected with parturition, the question of *viability* of the child is not unimportant. After the intra-uterine age of seven months is reached the child is certainly viable. The period at which the fetus becomes viable cannot be stated with certainty; but five calendar months, or one hundred and fifty days, is perhaps the nearest approximation which can be made. The viability of a child is judged by its size and weight, its general state of development, the state of the skin, hair and nails, its strength or feebleness, the ability to cry, and its power of taking maternal nourishment. The question of *viability* has important bearing upon the crime of *infanticide* and the succession of property.

The subject of *superfetation*, or the possibility of

two conceptions having occurred, resulting in the birth of twins with a considerable intervening interval, is a very obscure one, and has given rise to much controversy—its existence being affirmed by some medical jurists, and denied by others. There is much, however, (e.g., the existence of a double or bifid womb), to countenance the view that a double conception is possible.

In the curious case of a man marrying a woman having possession of an estate of inheritance, and by her having issue born alive, and capable of inheriting her estate, the man, on the death of his wife holds her lands for life as a tenant by the "curtesy" of England. Here the meaning of "born alive" is different from the meaning of the same expression as used respecting infanticide. In questions of tenancy by the curtesy it has been decided that any kind of motion of the child, as a twitching and tremulous motion of the lips, is sufficient evidence of live-birth. As regards infanticide, proof of a conclusive separate existence of the child is demanded before live-birth is admitted.

8. *Monsters and Hermaphrodites.*—To destroy any living human birth, however unlike a human creature it may be, is to commit a crime. Blackstone states that a monster which hath not the shape of mankind hath no inheritable blood; but the law has not defined a monster, nor what constitutes a human form. The same author states that if, in spite of deformity, the product of birth has human shape, it may be an heir. Hermaphrodites are beings with malformations of the sexual organs, simulating a double sex. Physiologists do not admit, however, the existence of true hermaphrodites with double perfect organs, capable of performing the functions of both sexes.

9. *Paternity and Affiliation.*—These are often matters of great doubt. A considerable time may elapse between the absence or death of a father and the birth of his reputed child. As has already been said, three hundred days is the utmost limit to which physiologists would extend the period of utero-gestation. This subject involves questions respecting children born during a second marriage of the mother, posthumous children, bastardy, and alleged cases of posthumous children.

10. *Presumption of Survivorship.*—When two or more persons perish by a common accident, when a mother and her new-born child are found dead, and in a few analogous cases, important civil rights may depend upon the question which lived the longest; and great ingenuity has been displayed in elucidating the disputes which have arisen in the law courts in such cases.

11. *Maladies Exempting from Discharge of Public Duties* frequently demand the attention of the medical man. He may be called upon to decide whether a man is able to undertake military or naval service, to act as a jurymen without serious risk to life or health, or to attend as a witness at a trial. An endeavor to give a fearless and honest certificate should animate the medical man in the discharge of this delicate duty.

12. *Feigned and Simulated Diseases* often require much skill and acuteness in order to detect the imposture. Where there is reason to suppose that a disease is simulated, much caution as to procedure is also required.

13. *Insanity or Mental Alienation.*—This subject presents an enormous field to the medical jurist. A medical man may be required to give evidence in any of the law courts, civil, criminal, or ecclesiastical, before commissions de *lunatico inquirendo*, or before a magistrate, as to the sanity or insanity of an individual; and he may have to sign certificates of unsoundness of

mind with the view of providing for the safe custody and proper treatment of a lunatic. Hence he must be familiar with the chief forms of insanity (see *INSANITY*), and be able to distinguish and treat each of these. He will also be required to detect feigned insanity, and to examine persons charged with crime with the view of preventing real lunatics from being treated as criminals.

The terms "unsoundness of mind," applied to the condition of the mind itself, and "*non compos mentis*" to the person whose mind is affected, are legal terms applied to insanity. Lawyers have disputed as to whether imbecility should or should not be included under the head of insanity; but medical men include under this category all disorders or defects of the mind which disqualify a person for managing his affairs, and entering into a binding contract, or which render the individual morally irresponsible for his or her otherwise criminal actions. There is good legal authority for recognizing four forms of unsoundness of mind—*idiocy, dementia, mania, and monomania*.

The chief questions respecting unsoundness of mind which present themselves to the medical jurist are—is the person of sound or unsound mind; if unsound, are there real lucid intervals; is he fit to manage his affairs, to contract a marriage, or to execute a will; is he dangerous to others?

As grounds for restraint, English law recognizes only these conditions—danger to himself, inability to manage his own affairs and property, and danger to the person of others. Before an individual can be placed under restraint in an asylum the certificates of two medical men must be obtained, and the formal order of a relation or friend. The certificates, to be valid, must be signed by legally qualified medical practitioners, having no interest, direct or indirect, in the patient, or in the asylum to which he is to be sent. The medical examiners must pay separate visits, each medical man examining the patient separately. The certificates, which remain valid for seven days only, must bear the exact address of the lunatic, his occupation, and the date of the examination; they must also set forth distinctly the grounds of the opinion they express, under the separate heads of facts observed by the examiner, and facts (to be specified) communicated by others. In the case of pauper lunatics one medical certificate only is required, which is supplemented by an order from a justice of the peace. In urgent cases also one medical certificate suffices for incarceration in an asylum, provided that within three days of the patient's reception two other such certificates are signed by two other medical practitioners, not being connected with the asylum, upon a like examination. The superintendent or proprietor of the asylum must in all cases forward to the commissioners of lunacy a notice of admission within one clear day from the patient's admission. Any infringement of the statutory regulations subjects the person who commits it to a heavy penalty.

II. INJURIES TO THE PERSON.

1. *Deforation*.—The signs of deforation are obscure and uncertain; and it is rather by the coëxistence of several of the usual marks than the existence of any one sign, that any just conclusions can be arrived at.

2. *Rape*.—This crime consists in the carnal knowledge of a woman forcibly and against her will. The resistance must be to the utmost, else the crime of rape has not been committed in the legal sense of the word. The proofs of rape, accordingly, apart from the consistency of the woman's story, mainly depend on the presence of the signs of deforation, and on marks of injury on the man.

3. *Mutilation*.—This may consist in the cutting or maiming of any member; castration is the most important, and perhaps but rarely effected as a crime. Self-mutilation, giving rise to false accusations, is occasionally resorted to.

4. *Criminal Abortion*.—The crime of abortion consists in unlawfully administering to a woman, or causing to be taken by her (whether she be with child or not), with intent to procure her miscarriage, any poison or noxious thing, or using for the same purpose any instrument or other means whatsoever; also in the use of the same means, with the same intent, by any woman being with child.

5. *Homicide*.—The legal sense of the term homicide excludes such injuries as are the result of either accident or suicide. It embraces murder or willful homicide, manslaughter or culpable homicide, casual homicide, and justifiable homicide.

As a preliminary in all cases of homicide, it is the duty of the medical jurist in the first place to ascertain the fact of death, and to distinguish between real and apparent death; and then to determine, if possible, the period at which death took place.

Infanticide or child-murder is by law treated with the same severity as the murder of an adult. Indeed infanticide as a crime distinct from murder has no legal recognition. Practically this severity defeats itself, and offenses which are really cases of child-murder are often treated simply as cases of concealment of birth. The iniquity of the old law which threw the onus of proof of still-birth on the mother now no longer exists, and the law demands strict proof of live-birth at the hands of the prosecution. Hence the subject involves very nice points of forensic medicine. The child must be proved to have arrived at the period when there was a probability of its living (proof of viability); and as the establishment of respiration is necessary to prove live-birth the evidences of this act must be carefully investigated. The size and position of the lungs, and the state of the vessels concerned in fetal circulation, must be carefully noted. The fetal lungs are dark, dense, and liver-like in appearance and consistence, and sink when immersed in water; while the fully respired lungs are rosy, marbled, and soft and crepitant when handled. Minor degrees of respiration are recognized by the appearance of little groups of dilated air-vesicles, and by the fact that, although the lungs as a whole may sink in water, certain portions of them, into which respired air has penetrated, float in water even after subjection to firm pressure in the hand. Care must be taken, nevertheless, to exclude buoyancy of the lung due to putrefaction; in this case the air may be expelled by gentle pressure, and the previously buoyant portion of lung now sinks in water. It is impossible, however, to distinguish certainly between a lung naturally inflated and one artificially insufflated.

It must be borne in mind that, although live-birth cannot be affirmed in the absence of signs of respiration, the presence of these signs is not proof of live-birth in the legal sense of the term. The law demands for live-birth a separate existence of the child after delivery; and breathing may take place while the child is still either wholly or partially within the maternal passages, and in some special cases while still within the womb itself.

When proofs of respiration—it may be to such an extent as to leave no doubt as to live-birth—have been found, the cause of death is then to be investigated. Wounds, and other forms of injury, must be sought for. There may be signs of strangulation, suffocation, puncture of the fontanelles, and consequent injury to the brain, the administration of a poison, or other means of

procuring death. It must be borne in mind that some of these causes may be brought about by omission, or even by accident. Thus strangulation may arise from natural and unrelieved pressure of the navel string on the neck of the child; suffocation from immersion of the face of the child in the maternal discharges, or by pressure of clothes on the mouth. Death may result from hæmorrhage through neglect to tie the navel string, or the infant may perish from exposure to cold.

In the case of exposed infants it is very important to ascertain the real mother. As such exposure usually takes place soon after birth, comparison of the age of the infant with the signs of recent delivery in the suspected mother is the best method of proving the relation.

Ordinary homicide may be accomplished by several modes that may sometimes be ascertained by examination of the body. Of one of the most important of these consideration is deferred to the article POISONS.

Death by *asphyxia* is a common mode of accomplishing homicide, as by suffocation, drowning, hanging, strangulation, or by exposure to mephitic air. Suicide and accidental death from these causes are still more common. (1) *Drowning* is thought to produce death occasionally by the suddenness of the shock causing suspension of the functions of circulation and respiration—by shock without a struggle. The usual mode of death appears, however, to be by the circulation of un-oxygenated blood through the brain acting as a poison upon that organ; and this is attended with all the phenomena of asphyxia, as in suffocation. The phenomena attending asphyxia are as follows:—As soon as the oxygen in the arterial blood, through exclusion of air, sinks below the normal, the respiratory movements grow deeper and at the same time more frequent; both the inspiratory and expiratory phases are exaggerated, the supplementary respiratory muscles are brought into play, and the breathing becomes hurried. As the blood becomes more and more venous, the respiratory movements continue to increase in both force and frequency. Very soon the expiratory movements become more marked than the inspiratory, and every muscle which can in any way assist in expiration is brought into play. The orderly expiratory movements culminate in expiratory convulsions; these violent efforts speedily exhaust the nervous system, and the convulsions suddenly cease and are followed by a period of calm. The calm is one of exhaustion; all expiratory active movements have ceased, and all the muscles of the body are flaccid and quiet. But at long intervals lengthened, deep inspiratory movements take place; then these movements become less frequent; the rhythm becomes irregular, so that each breath becomes a more and more prolonged gasp, which becomes at last a convulsive stretching of the whole body; and with extended limbs and a straightened trunk, with the head thrown back, the mouth widely open, the face drawn, and the nostrils dilated, the last breath is taken. The above phenomena are not all observed except in cases of sudden and entire exclusion of air from the lungs. In slow asphyxia, where the supply of air is gradually diminished (e.g., in drowning), the phenomena are fundamentally the same, but with minor differences. The appearances of the body after death from drowning are various. There may be pallor of the countenance, or this may be livid and swollen. The air passages are filled with frothy mucus, and there may be water in the stomach. The ends of the fingers are often excoriated from grasping at objects; and weeds, etc., are sometimes found grasped in the hands. The distinction between murder and suicide by drowning can rarely be made out by examination of the body alone, and is usually decided from collateral circumstances or marks of a struggle. At-

tention must also be paid to the existence of wounds on the body, marks of strangulation on the neck, and the like. (2) *Hanging* may result in death from asphyxia, or, as is more particularly the case in judicial hanging, some injury is inflicted on the upper portion of the spinal cord, resulting in instant death. The ordinary appearances of death from asphyxia may be found: dark fluid blood, congestion of the brain, intensely congested lungs, the right cavities of the heart full, and the left comparatively empty of blood, and general engorgement of the viscera. Ecchymosis may be found beneath the site of the cord, or a mere parchmenty appearance. There may even be no mark of the cord visible. The mark, when present, usually follows an oblique course, and is high up the neck. The fact that a body may be suspended after death, and that if this be done speedily while the body is still warm there may be a *post-mortem* mark undistinguishable from the mark observed in death from hanging, must not be forgotten. (3) *Suffocation* may occur from the impaction of any substance in the glottis, or by covering up the mouth and nose. It is frequently of accidental origin, as when substances become accidentally impacted in the throat, and when infants are overlaid. The phenomena are those of pure asphyxia, which have already been detailed. On *post-mortem* examination the surface of the lungs is found covered with minute extravasations of blood, known as punctuated ecchymosis. (4) *Strangulation* may be accomplished by drawing a cord tightly around the neck, or by forcibly compressing the windpipe (throttling). Hence there may be either a circular mark around the neck, not so oblique as after hanging, or the marks of the fingers may be found about the region of the larynx. The cartilaginous structure of the larynx and windpipe may be broken. The mark of the ligature is often low down in the neck. The signs of asphyxia are present in a marked degree. (5) *Mephitism*.—Death from the inhalation of irrespirable gases is a mode of assassination seldom employed, but is frequently resorted to on the Continent by suicides, charcoal fumes being commonly used for the purpose (see POISONS).

6. *Death from Starvation*.—Cases occur in which it is important to distinguish this from other modes of death. In such cases the skin becomes harsh and dry, and may acquire a peculiar odor; the subcutaneous fat disappears; the gums shrink away from the teeth; the tongue and mouth become dark-colored and dry; the eyes are bloodshot; the intestines become thin and their coats translucent; the gall-bladder is distended. The period of total abstinence from food required to kill an adult is unknown, and greatly depends upon whether there be access to liquid. In some cases persons have been able to subsist on little or no nourishment for long periods, the body being in a state of quasi-hibernation.

7. *Death from Extremes of Temperature*.—(1) Death from cold is not often observed. A portion only of the body, as the extremity of a limb, may perish from extreme cold. After the first sensation of tingling experienced on exposure to severe cold, loss of sensation supervenes, with languor and an irresistible propensity to sleep. The tendency to this forms an extreme danger in such cases. (2) Death from extreme heat usually occurs in the form of burning and scalding, attended with destruction of a large portion of the cutaneous structures. Here the cause of death is obvious. The human body is capable of exposure to very hot air—as is seen in Turkish baths—for a considerable period with impunity. Sun-stroke is a cerebral affection brought on by too great exposure to a hot atmosphere, especially while undergoing fatigue.

8. *Death by Lightning.*—Lightning or an artificial electric current may cause instant death. No visible marks of the effects of the electric current may be left, or the body may be singed or discolored, or the skin may be perforated at one or two spots.

9. *Wounds.*—The examination of wounds, whether fatal or not, often becomes an important branch of forensic medicine. Wounds are usually divided into *contused, lacerated, incised, punctured, and gunshot* wounds. For poisoned wounds see POISONS. Each kind of wound requires to be minutely examined and described, as they are in approved works on surgery. The degree of danger from each should be familiar to the medical jurist; and he should recollect that there is no wound which may not become incidentally fatal from improper treatment, peculiarities of constitution, or accidental inoculation with septic material. Punctured wounds or stabs require minute attention; for there have been instances in which death has been produced by an instrument so small as a pin thrust into a vital part. *Wounds of the head* are always dangerous, especially if the blow has been severe. The person so wounded may die without division of the skin, or fracture of the bones, as happens in what is known as *concussion* of the brain. Contusions which do not divide the skin may fracture the skull; or the inner table of the skull may be fractured without the outer being broken or depressed. Even wounds of the scalp may prove fatal, from inflammation extending toward the brain. Punctured wounds of the head are more dangerous than cuts, as more likely to excite fatal inflammation. When the brain and its membranes are injured, all such wounds are generally fatal. Wounds of the face or organs of sense are often dangerous, always disfiguring, and productive of serious inconvenience. *Wounds of the neck* are always very serious wherever more than the skin is divided. The danger of opening large blood-vessels, or wounding important nerves, is imminent; even the division of a large vein in the neck has proved immediately fatal, from the entrance of air into the vessel, and its speedy conveyance to the heart. A blow on the neck has instantly proved fatal, from injury to an important nerve, generally the pneumogastric or the sympathetic. Dislocations and fractures of the bones of the neck prove instantly fatal. *Wounds of the chest* are always serious when the cavity is penetrated, though persons may recover from wounds of the lungs, and have even survived for some time considerable wounds of the heart. This last is an important fact; because we are not always to consider the spot where the body of a person killed by a wound of the heart, and apparently remaining where he fell, is found as that in which the fatal wound was inflicted. Instances have occurred of persons surviving severe wounds of the heart for several days. Broken ribs are never without danger; and the same may be said of severe contusions of the chest, from the chance of inflammation extending inward. Wounds penetrating both sides of the chest are generally considered as fatal; but possibly there may be recovery from such. *Wounds of the abdomen*, when they do not completely penetrate, may be considered as simple wounds, unless when inflicted with great force, so as to bruise the contents of the abdominal cavity; in that case they may produce death without breach of surface, from rupture of some viscus, as sometimes happens from blows or kicks upon the belly. Wounds injuring the peritoneum are highly perilous, from the risk of severe inflammation. Wounds of the stomach or intestines, or of the gall-bladder, generally prove mortal, from the effusion of their contents into the peritoneal cavity producing fatal inflammation. Wounds of the liver, spleen, or kidneys are generally soon mortal,

from the great vascularity of those organs. Wounds of the extremities, when fatal, may generally be considered so from excessive hemorrhage, from the consequences of inflammation and gangrene, or from the shock to the system when large portions of the limb are forcibly removed, as in accidents from machinery, and in wounds from firearms.

10. *Poisonous Food.*—Under certain conditions, various articles of diet, especially butcher meat, eggs, milk, butter, cheese, and honey, may become possessed of poisonous properties, and this may arise from a variety of causes besides the introduction of known and specific poisons. Moreover, certain kinds of animal food—fish chiefly—may have definite toxic properties. Food may be more or less poisonous—(1) from unsoundness, either from putridity or decomposition or disease; (2) from the presence of parasites; (3) from moldiness, or presence of deleterious microscopic fungi; and (4) where the flesh is that of animals which have fed on noxious plants—and under this head may also be classed poisonous honey, which bees have gathered from poisonous plants. (5) It may be of the nature of poisonous fish, using the term fish in the popular sense. (6) Certain fungi or mushrooms are poisonous. Parasitic diseases would, strictly speaking, come under the first head; but the preventive measures to be adopted in the use of food infested with parasites will alone be treated of in this place.

(1) *Poisonous Vegetables.*—Unsound or even rotten vegetables and fruits may be consumed, and become fertile sources of varied forms of poisoning, especially in hot summers. The symptoms produced by the ingestion of large quantities of unsound fruit or vegetables are of a diarrhoeal character, not often of an alarming severity, except in the case of the young and feeble. They may, however, sometimes attain a fatal severity. The cause is usually obvious, and the treatment simple; mild purgatives, as rhubarb or castor oil, with or followed by opiates, to remove peccant matters from the intestines; and stimulants, as ammonia or alcohol, if there be much collapse. Certain fungi or mushrooms are known to be specially poisonous, such as the *Amanita muscaria*, or fly-fungus, and others. Certain kinds of mushrooms, usually innocuous, are occasionally poisonous or deleterious; and the cause of it is not always clear. Poisonous fungi produce narcotic and irritant symptoms.

(2) *Poisonous, Tainted, or Putrid Meat.*—The obvious characteristics of good sound flesh meat are that its color is red—neither pale pink nor deep purple; that it is marbled in appearance; firm and elastic to the touch, scarcely moistening the fingers; having a slight and not unpleasant odor; and that when exposed to the air for a day or two it should neither become dry on the surface nor wet and sodden. Sound meat is acid to litmus paper; unsound meat may be neutral or alkaline. Meat may be tainted with phlegm administered to the animal. It is a common practice, when a fat and valuable animal is unwell, to physic it, and if its recovery be not speedy to slaughter it. The meat of such animals may often be met with in our markets, and may induce illness from the phlegm with which it is contaminated. The effects of simple putridity are most varied. It is well known that some nations habitually eat putrid meat, and even prefer it to fresh; and the development of rottenness in eggs for the epicure is an art in China. There is no doubt that habit has much to do with the tolerance by the stomach of putrid meat, whether cooked or uncooked. But tainted game, and indeed all kinds of meat in which putrefaction has commenced, may indubitably produce disease. This is chiefly of a diarrhoeal character, preceded by rigors, and attended with col-

lapse, and, it may be, convulsions and other signs of a profound affection of the nervous system. The effects of such tainted meat are slight as compared with those which are produced by the sausage-poison, developed by a sort of modified putrefaction in certain German sausages. These sausages, when they become musty and soft in their interior, nauseous in odor and flavor, and strongly acid to test paper, acquire a highly poisonous character, and are frequently fatal in their effects. The symptoms produced by the use of poisonous flesh are gastric pain, vomiting, diarrhoea, depression, coldness of the limbs, and weak, irregular action of the heart. Fatal cases end in convulsions and oppressed respiration, death ensuing from the third to the eighth day. The nature of the sausage-poison, which is probably akin to that of putrid and indeed all non-specifically tainted meats, has been a matter of considerable controversy. Some have held that the poisonous action is due to the development of rancid fatty acids; others believe that a so-called catalytic body is produced, capable of setting up by contact a similar catalytic action. Others have regarded the sausage-poison as due to the formation of pyrogenous acids during the drying or smoking of the sausages. The recent discovery by Selmi of a class of poisonous alkaloids or amides, termed *ptomaines*, developed during putrefaction of animal matters, on the one hand, and the discovery by Ballard and Klein, still more recently, that the fatally poisonous properties of hams prepared according to the American method may be due to the presence of a parasitic bacillus, point to one or other of these two latter causes as that of the effects of sausage-poison. Others again have referred the effects to the presence of a microscopic fungus—*Sarcina botulina*.

The poisonous nature of the flesh of animals which have fed on certain plants—for example, hares which have fed on certain species of rhododendron, pheasants on the kalmia shrub, etc.—has been abundantly demonstrated, and need only be referred to here. The honey from bees which have garnered on poisonous plants, as the azalea, may likewise be deleterious; and the fact is of classic interest. The milk even of goats which have browsed on poisonous herbs has also proved poisonous.

(3) *Diseased Meat*.—The poisonous effects of meat affected with certain parasites—trichinæ, cysticerci, trematodes, etc., is an undoubted fact. Great quantities of meat pass through our markets which is undoubtedly the flesh of animals affected with disease, such as foot-and-mouth disease, pleuro-pneumonia, pig typhoid, the so-called scarlatina of swine, sheep-pox, etc.; and the question is quite undecided as to whether such flesh produces any injurious effects. To stop the sale of such meat would be to cut off large sources of our meat supplies. The evils attending the use of such diseased meat, when well cooked, have undoubtedly been exaggerated; but, on the other hand, there is enough evidence to show that the use of certain kinds of diseased meat may be followed by serious results. Thus it is generally admitted that the flesh of animals which have suffered from pleuro-pneumonia and murrain will give rise to boils and carbuncles. Braxy mutton may also produce disease when eaten. Trichinæ will produce trichinosis, flukes, the tapeworm, etc. Hams are occasionally fatally poisonous; and this has been traced to the presence of certain low organisms known as *bacilli*.

(4) *Poisonous Fish*.—Fish is sometimes a poisonous article of food. Cases of poisoning by the so-called shell-fish of the British Islands are not infrequently met with. Generally it is the eating of crabs, lobsters, and mussels which produces such results. These are usually of a distressing rather than of a serious character, nettles-rash being a common symptom. Occasionally, how-

ever, fatal results have ensued from the use of mussels. In tropical seas poisonous fish are more plentiful—the golden sardine, the bladder fish, the gray snapper, etc.; and, these being eaten by larger fish, as the barracuda, perch, globe-fish, conger eel, etc., the latter may in turn become poisonous.

Good cookery, that is, exposure to a sufficiently high temperature for a sufficiently lengthened time, is undoubtedly the best measure to adopt short of absolute destruction of unsound and diseased meat. So long as meat is high-priced, and the effects of diseased meats so little understood and so undefined, it will be impossible to induce medical officers or health and sanitary inspectors to seize all the diseased and unsound meat which is daily offered for sale. Notwithstanding all that has been said to the contrary, experienced observers are pretty well agreed that thorough exposure of the meat throughout to the temperature at which albumen is coagulated is destructive to the parasites of flesh. Smoking is less effective. Salting is more effective than smoking; but there is some evidence to show that salting may merely hold the life of organisms in suspense without entirely destroying their vitality; and thus in the conversion of salted pork into hams—a process of re-salting and subsequent drying—the specific germ (a bacillus) has been known to be again rendered harmful. It is not known whether efficient cooking entirely removes the deleterious effects of flesh affected with other than parasitic disease, as for example pleuro-pneumonia.

The curative measures for the results of eating poisonous food cannot be specially described. They are those which must be arrived at on general principles. Symptoms are to be treated, and the powers of the patient sustained until the deleterious matter is removed by the ordinary channels, or the trichinæ have become encysted.

HISTORY OF FORENSIC MEDICINE.

In regard to the means and appliances used for the detection of crime, the microscope and spectroscope have of late years taken the front rank. So important indeed has the microscope become that the science of MICROSCOPY (*q.v.*) may be said to be the most efficient adjunct of medical jurisprudence. Medical jurisprudence, as a science, dates only from the sixteenth century.

At the close of the sixteenth century Ambrose Paré wrote on monsters, on simulated diseases, and on the art of drawing up medico-legal reports; Pineau also published his treatise on virginity and defloration. About the same time as these stimuli to the study of forensic medicine were being made known in Paris, the first systematic treatise on the science appeared in Sicily in the form of a treatise *De Relationibus Medicorum* by Fidele. Paulo Zacchia, the illustrious Roman medical jurist, moreover published from 1621 to 1635 a work entitled *Questiones Medico-Legales*, which marks a new era in the history of the science—a work which displays an immense amount of learning and sagacity in an age when chemistry was in its infancy, and physiology very imperfectly understood. The discovery of the circulation of the blood by Harvey soon followed, and gave a new impetus to the study of those branches of forensic medicine having direct relations to physiology; and to Harvey we owe the idea how to apply Galen's observations on the differences between the fetal and the adult lungs to the elucidation of cases of supposed infanticide. About this time, too, Sebiz published two treatises on the signs of virginity and on the examination of wounds respectively. In the former he contended that the hymen was the real mark of virginity; but this was denied by Augenio and Gassendi. In 1663 Bartholin, a

Danish physician, investigated the period of human uterine gestation, a subject which had engaged the attention of Aristotle. He also proposed the "hydrostatic test" for the determination of live-birth—a test still in use, and applied by observing whether the lungs of an infant float or sink in water. Swammerdam explained the rationale of the process in 1677; but it was not till 1682 that it was first practically applied by Jan Schreyer.

Germany, ever the leader in questions of forensic medicine, introduced the first public lectures on medical jurisprudence.

Professorships for teaching the subject were founded in the German universities early in the eighteenth century, and numerous treatises on forensic medicine were published.

In the present century France took the lead; and the institution of three professorships of forensic medicine at the end of the eighteenth century produced excellent fruits.

Though forensic medicine may be said to have been entirely neglected in England till the beginning of the present century, its progress has since been by no means slow or unimportant; and the subject now forms a recognized and obligatory method of study.

America, too, has not been behindhand in the race. Wharton and Stillé's *Manual* and Wormley's *Toxicology* are the best-known works of American authors.

MEDICI. This family is renowned in Italian history for the extraordinary number of statesmen to whom it gave birth, and for its magnificent patronage of letters and art. It emerged from private life and rose to power by means of a very subtle policy that was persistently pursued from generation to generation. The origin of the family is buried in obscurity. Some court historians indeed declare it to have been founded by Perseus, and assert that Benvenuto Cellini's bronze Perseus holding on high the head of Medusa was executed and placed in the Loggia dei Lanzi to symbolize the victory of the Medici over the republic. But this only proves that the real origin of the family is unknown, and equally unknown is the precise signification of the Medicean arms—six red balls on a field of gold.

The name appears in Florentine chronicles as early as the close of the twelfth century, although only casually mentioned in connection with various offices of the republic. The first of the family to be a distinct figure in history was Salvestro dei Medici, who, in the year 1378, took an active part in the revolt of the Ciompi.

On Salvestro's death in 1388 the Albizzi repossessed themselves of the government, and conducted the wars of the republic. Vieri dei Medici, who seems to have been the next head of the family, understanding the temper of the times, abstained from becoming a popular leader, and left it to his successors to prosecute the task under easier conditions. Then in the person of Giovanni, son of Bicci dei Medici (1360-1429), another branch of the family arose, and became from that time forward its representative branch. Indeed this Giovanni may be considered the actual founder of Medicean greatness. He took little part in political affairs, but realized an immense fortune by trade—establishing banks in Italy and abroad, which in his successors' hands became the most efficient engines of political power. The council of Constance (1414-1418) enabled Giovanni dei Medici to realize enormous profits. He died in 1429, leaving two sons, Cosimo (1389-1464) and Lorenzo (1395-1440). From the former proceeded the branch that held absolute sway for many generations over the nominal republic of Florence, and gave to Italy popes like Leo X. and Clement VII. On the extinction of this elder line in the sixteenth century, the younger branch, derived from Lorenzo, Cosimo's brother, seemed to acquire new life,

and for two centuries supplied grand-dukes to Tuscany. Cosimo, surnamed Cosimo the Elder, to distinguish him from the many others bearing the same name, and honored after his death by the title of *Pater Patriæ*, first succeeded in solving the strange problem of becoming absolute ruler of a republic that was keenly jealous of its liberty, without holding any fixed office, without suppressing any previous form of government, and always preserving the appearance and demeanor of a private citizen. On August 1, 1464, Cosimo breathed his last, at the age of seventy-five, while engaged in listening to one of Plato's dialogues.

The lordship of Florence passed into the hands of Piero, surnamed the Gouty, Cosimo's only surviving legitimate son. Piero died at the end of five years' reign, December 3, 1469, leaving two sons, Lorenzo (1449-92) and Giuliano (1453-78). The younger, the gentler, and less ambitious of the pair was, as we shall presently see, quickly removed from the world. Lorenzo, on the contrary, at once seized the reins of state with a firm grasp, and was, chronologically, the second of the great men bestowed upon Italy by the house of Medici. At his father's death he was only twenty-one years old, but instantly showed his determination to govern Florence with greater despotism than his father or grandfather.

On April 26, 1478, while Giuliano and Lorenzo were attending high mass in the cathedral of Florence, the former was mortally stabbed by conspirators, but the latter was able to beat back his assailants and escape into the sacristy. His life saved, and no longer having to share the government with a brother, Lorenzo profited by the opportunity to wreak cruel vengeance upon his foes. Several of the Pazzi and their followers were hanged from the palace windows; others were hacked to pieces, dragged through the streets, and cast into the Arno, while a great many more were condemned to death or sent into exile. Lorenzo seemed willing and able to become a tyrant. But he stopped short of this point. His palace was the school and resort of illustrious men. He was an elegant prose writer, and was likewise a poet of real originality. At that period Italians were forsaking erudition in order to forward the revival of the national literature by recurring to the primitive sources of the spoken tongue and popular verse. It is Lorenzo's lasting glory to have been the initiator of this movement. Without being—as some have maintained—a poet of genius, he was certainly a writer of much finish and eloquence, and one of the first to raise popular poetry to the dignity of art.

Lorenzo left three sons—Pietro (1471-1503), Giovanni (1475-1521), and Giuliano (1479-1516). He was succeeded by Pietro, whose rule lasted but for two years.

The ensuing period was adverse to the Medici, for a republican government was maintained in Florence from 1494 to 1512, and the city remained faithful to its alliance with the French, who were all-powerful in Italy. Cardinal Giovanni, the head of the family, resided in Rome. Pietro had now been dead for some time, leaving a young son, Lorenzo (1492-1519), who was afterward duke of Urbino. The following year (1513) Cardinal Giovanni was elected pope, and assumed the name of Leo X.

Leo X., who is only indirectly connected with the history of Florence, gave his name to the age in which he lived in consequence of his magnificent patronage of art and letters in Rome. But he was merely a clever amateur, and had not the literary gifts of his father Lorenzo. Giuliano dei Medici had died during Leo's reign, in 1516, without having ever done anything worthy of record. Lorenzo, being of more ambitious temper, was by no means content to remain at the

head of the government of Florence hampered by many restrictions imposed by republican institutions, and subject to the incessant control of the pope. By his marriage with Madeleine de la Tour d'Auvergne, he had one daughter, Caterina dei Medici (1519-89), married, in 1533, to Henry, duke of Orleans, afterward king of France. She played a long and sinister part in the history of that country. Lorenzo also left a natural son named Alessandro, inheriting the frizzled hair and projecting lips of the negro or mulatto slave who had given him birth. His miserable death will be presently related. Thus the only three surviving representatives of the chief branch of the Medici, Cardinal Giulio, Ippolito, and Alessandro, were all of illegitimate birth, and left no legitimate heirs.

Cardinal Giulio, who had labored successfully for the reinstatement of his family in Florence in 1512, had been long attached to the person of Leo X. as his trusted factotum and companion. He had been generally regarded as the mentor of the pope, who had no liking for hard work. But in fact, his frivolity notwithstanding, Leo X. always followed his own inclinations. He had much aptitude for command, and pursued his shuffling policy without any mental anxiety. Giulio, on the contrary, shrank from all responsibility, muddled his brains in weighing the reasons for and against every possible decision, and was therefore a better tool of government in others' hands than he was fit to govern on his own account. When Giuliano and Lorenzo died, the pope appointed the cardinal to the government of Florence. In that post, restricted within the limits imposed by republican institutions, and acting under the continual direction of Rome, he performed his duties fairly well. He caressed the citizens with hopes of extended liberties, which, although never destined to be fulfilled, long served to keep men's minds in a pleasant flutter of expectation; and when the more impatient spirits attempted to raise a rebellion he speedily quenched it in blood. When, after the death of Leo X. and the very brief pontificate of Adrian VI., he was elected pope (1523) under the name of Clement VII., he intrusted the government of Florence to Cardinal Silvio Passerini conjointly with Alessandro and Ippolito, who were still too young to do much on their own account.

The question of the moment was the transformation of the old republican régime into a principedom; as an unavoidable result of this change it followed that Florence was no longer to be the ruling city to whose inhabitants alone belonged the monopoly of political office. When the leading Florentine families realized, not only that the republic was destroyed, but that they were reduced to equality with those whom they had hitherto regarded as their inferiors and subjects, their rage was indescribable, and hardly a day passed without the departure of influential citizens who were resolved to achieve the overthrow of their new ruler. They found a leader in Cardinal Ippolito dei Medici, who was then in Rome, embittered by the preference given to Alessandro, and anxious to become his successor with the least possible delay. Under the pressure of terror the duke at once became a tyrant. He garrisoned the different cities, and began the erection in Florence of the Fortezza da Basso, built chiefly at the expense of Filippo Strozzi, who afterward met his death within its walls.

In 1534 Clement VII. died, and the election fell on Paul III., from whom Cardinal Ippolito hoped to obtain assistance for his designs. Accordingly the principal Florentine exiles were dispatched on a mission to the emperor Charles V., with complaints of Alessandro's tyranny and his shameless violation of the terms upon which the city had surrendered. Duke

Alessandro, being cited to appear, came to Naples accompanied by Francesco Guicciardini, who by speaking in his defense rendered himself odious to all friends of liberty, and irretrievably tarnished his illustrious name. On this account, and perhaps to some extent through the emperor's personal liking for the duke, the latter rose higher than before in the imperial favor, married Margaret of Austria, the natural daughter of Charles, and returned to Florence with increased power. He was murdered by his cousin in 1537. By Alessandro's death the elder branch of the Medici became extinct, and thus the appearance of the younger line was heralded by a bloody crime.

Guicciardini, Vettori, and others of the leading citizens favored the choice of Cosimo, the son of Giovanni delle Bande Nere, for his successor. He was already in Florence, was aged seventeen, was keen-witted and aspiring, strong and handsome in person, heir to the enormous wealth of the Medici, and, by the terms of the imperial patent, was Alessandro's lawful successor. Charles V. approved the nomination of Cosimo, who without delay seized the reins of government with a firm grasp. Like Alessandro, he was named head of the republic; and Guicciardini and others who had worked hardest in his cause hoped to direct him and keep him under their control. But Cosimo soon undeceived them by proving that, his youth notwithstanding, he had a will of his own, and was resolved to rule unshackled by republican form and unhampered by advisers disposed to act as mentors. The Florentines had now an absolute prince who was likewise a statesman of eminent ability.

In 1539 he espoused Eleonora of Toledo, daughter of the viceroy of Naples, by whom he had several children. Two died in 1562, and their mother soon followed them to the grave. It was said that one of these boys, Don Garcia, had murdered the other, and then been killed by the enraged father. Indeed Cosimo was further accused of having put his own wife to death; but neither rumor had any foundation. He now showed signs of illness and failure of strength. He was not old, but worn by the cares of state and self-indulgence. Accordingly in 1564 he resigned the government to his eldest son, who was to act as his lieutenant, since he wished to remain the virtual head of the state and have power to resume the scepter on any emergency. In 1570, by the advice of Pius V., he married Camilla Martelli, a young lady of whom he had been long enamored. In 1574 he died, at the age of fifty-four years and ten months, after a reign of thirty-seven years, leaving three sons and one daughter besides natural children. These sons were Francesco, his successor, who was already at the head of the government, Cardinal Ferdinand, and Piero.

Francesco I., born in 1541, began to govern as his father's lieutenant in 1564, and was married in 1565 to the archduchess Giovanna, of Austria. On beginning to reign on his own account in 1574, he speedily manifested his real character. Francesco was a slave to his passions, and was led by them to scandalous excesses and deeds of bloodshed. His example and neglect of the affairs of the state soon caused a vast increase of crime even among the people, and, during the first eighteen months of his reign, there occurred no less than one hundred and sixty-eight murders. On October 18, 1587, the grand-duke died at his villa of Poggio a Caiano.

Ferdinand I. was thirty-eight years of age when, in 1587, he succeeded his brother on the throne. He was in all respects his brother's opposite. Affable in his manners and generous with his purse, he chose a crest typical of the proposed mildness of his rule—a swan

of bees with the motto *Majestate tantum*. He instantly pardoned all who had opposed him, and left his kinsmen at liberty to choose their own place of residence. Occasionally, for political reasons, he committed acts unworthy of his character; but he reestablished the administration of justice, and sedulously attended to the business of the state and the welfare of his subjects.

Ferdinand I. died in 1609, leaving four sons, of whom the eldest, Cosimo II., succeeded to the throne at the age of nineteen. He was at first assisted in the government by his mother and a council of regency. He had a good disposition, and the fortune to reign during a period when Europe was at peace and Tuscany blessed with abundant harvests.

Like his predecessors, Cosimo II. studied to promote the prosperity of Leghorn, and he deserves honor for abandoning all commerce on his own account. The best deed done by Cosimo II. was the protection accorded by him to Galileo Galilei, who had removed to Padua, and there made some of his grandest discoveries. The grand-duke recalled him to Florence in 1610, and nominated him court mathematician and philosopher. Cosimo died in February, 1621, after twelve years of a quiet reign marked by no great event.

In 1627 Ferdinand II., then aged seventeen, assumed the reins of government; but, being of a very gentle disposition, he decided on sharing his power with the regents and his brothers, and arranged matters in such wise that each was almost independent of the other. He gained the love of his subjects by his great goodness; and, when Florence and Tuscany were cruelly ravaged by the plague in 1630, he showed admirable courage, and carried out many useful measures. But he was totally incapable of energy as a statesman.

Cosimo III. succeeded his father (Ferdinand) in 1670. He was weak, vain, bigoted, and hypocritical. Cosimo's hypocritical zeal for religion compelled his subjects to multiply services and processions, that greatly infringing upon their working hours. He wasted enormous sums in pensioning converts—even those from other countries—and in giving rich endowments to sanctuaries. Meanwhile funds often failed for the payment of government clerks and soldiers.

Cosimo's dominant anxiety regarded the succession to the throne. His eldest son, Ferdinand, died childless in 1713. The pleasure-loving Giovan Gastone was married to Anna Maria of Saxe-Lauenburg, widow of a German prince, a wealthy, coarse woman wholly immersed in domestic occupations, and who seemed little likely to give birth to any children. After living with her for some time in a Bohemian village, Giovan Gastone yielded to his dislike to his wife and her country, withdrew to France, and ruined his health by excesses. After a brief return to Bohemia he finally separated from his wife, by whom he had no family. Thus the dynasty was doomed to extinction. Cosimo had a passing idea of reconstituting the Florentine republic, but, this design being discountenanced by the European powers, he determined to transfer the succession, after the death of Giovan Gastone, to his sister, Anna Maria Louisa, who in fact survived him. For this purpose he proposed to annul the patent of Charles V., but the powers objected to this arrangement also, and by the treaty of 1718 the quadruple alliance of Germany, France, England, and Holland decided that Parma and Tuscany should descend to the Spanish Infante, Don Carlos. The grand-duke made energetic but fruitless protest.

Cosimo III. had passed his eightieth year at the time of his decease in October, 1723, and was succeeded by his son Giovan Gastone, then aged fifty-three. The new sovereign was in bad health, worn out by dissipa-

tion, and had neither ambition nor aptitude for rule. He wished to live and let live, and liked the people to be amused. Everything in fact bore a freer and gayer aspect under his reign, and the Tuscans seemed to feel renewed attachment for the dynasty as the moment of its extinction drew near. But the grand-duke was too feeble and incapable to accomplish any real improvement. Surrounded by gay and dissipated young men, he intrusted all the cares of government to a certain Giuliano Dami, who drove a profitable trade by the sale of offices and privileges. In this way all things were in the hands of corrupt individuals; while the grand-duke, compelled to pass the greater part of his time in bed, vainly sought diversion in the company of buffoons, and was only tormented by perceiving that all the world disposed of his throne without even asking his advice. And when, after prolonged opposition, he had resigned himself to accept Don Carlos as his successor, the latter led a Spanish army to the conquest of Naples, an event afterward leading to the peace of 1735, by which the Tuscan succession was transferred to Francesco II., duke of Lorraine, and husband of Maria Theresa. Giovan Gastone was finally obliged to submit even to this. Spain withdrew her garrison from Tuscany, and Austrian soldiers took their place and swore fealty to the grand-duke on February 5, 1737. He expired on July 9th of the same year. Such was the end of the younger branch of the Medici, which had found Tuscany a prosperous country, where art, letters, commerce, industry, and agriculture flourished, and left her poor and decayed in all ways, drained by taxation, and oppressed by laws contrary to every principle of sound economy, downtrodden by the clergy, and burdened by a weak and vicious aristocracy.

MEDICINE, the subject-matter of one of the learned professions, includes, as it now stands, a wide range of scientific knowledge and practical skill. The science of medicine is the theory of diseases and of remedies. While the notion of disease is necessarily or inevitably correlated with the notion of health, there is no necessary and invariable relation, but, on the other hand, a merely conventional association, between a disease and a remedy. That part of the science of medicine which corresponds to the theory of remedies is not, therefore, in a position scientifically inferior to the theory of diseases; for each article of the *materia medica*—apart from a few inert substances—has a certain effect on the organism in health and in disease, which is ascertainable with scientific precision. Those properties and actions of drugs are the subject of pharmacology and toxicology; the circumstances under which the several articles of the *materia medica* become remedial are the subject of therapeutics, and therapeutics is dependent for its scientific position upon the completeness of the theory of diseases, or pathology.

Disease is the correlative of health, and the word is not capable of a more penetrating definition. From the time of Galen, however, it has been usual to speak of the life of the body either as proceeding in accordance with nature, or as overstepping the bounds of nature. Taking disease to be a deflection from the line of health, the first requisite of medicine is an extensive and intimate acquaintance with the norm of the body. The normal condition of the body is capable of being determined without ambiguity; it is the absence from its structure and functions of every disease hitherto known. The structure and functions of the body form the subject of anatomy and physiology.

Physiology is, strictly speaking, the science of that which is in accordance with nature, and it is usual to say that the theory of diseases is based upon physiology. But, although all that was implied in the Hip-

pocratic term *natura* may be claimed as the subject-matter of physiology, yet, in the ordinary connotation of the term, physiology divides the empire with anatomy. To physiology the functions of the body are usually assigned, and to anatomy its form and structure. But, as a matter of fact, the structures and functions of the organism are not separable; structure is correlated to function, whether active, dormant, or extinguished, and in like manner function is the twin notion of structure. In the ultimate analysis neither term means anything without the other, and both together mean life. It is owing mostly to its name that physiology is supposed to have a preponderant interest for the theory of disease; the word anatomy is not well adapted to carry its own half of the structure-and-function dualism. Both in the historical development and in the logical connotation, anatomy is as much associated with the living and moving body as physiology itself; but its etymology has always been against it, and it has become more and more difficult to retain for anatomy anything beyond the technicalities of the dissecting-room. The subject of general anatomy has for the most part disappeared from modern textbooks, its place being taken by histology, which deals with the minute structure of the simple tissues, and, in a wider acceptance, with the finer anatomy of all the organs and parts of the body. Histology, like anatomy, has had a somewhat technical or descriptive rôle assigned to it; and it is now mainly under physiology that the processes, activities, or living mechanisms of the body fall to be considered. The development of the body as a whole, and of its several tissues and organs, forms the subject of embryology; many of the physiological types of diseased processes, especially the cellular, are discoverable in the embryological period. For the period of development, no arbitrary separation has been attempted hitherto between structure and function, and embryology is, in theory at least, as much physiological as anatomical. The development of function is a legitimate and even desirable subject of scientific study, and a more distinctive place is probably awaiting it in the future; but so indissoluble does the union of structure and function present itself in the period of genesis and growth that the function has hardly as yet come to be abstracted from the structure, or the structure from the function.

The theory of disease rests, therefore, upon physiology, with its more or less technical adjuncts. Pathology is all that physiology is, with the engrossing and difficult element of perturbation, deflexion, or shortcoming added. By virtue of this element of deviation from the line of health, pathology is a discipline apart, with an abundant literature of its own, and with separate academical institutes and chairs. But pathology is also a discipline apart by virtue of concepts proper to itself. A great part of the theory of disease deals with changes or defects of structure and perturbations or failings of function, which may be intricate or difficult to analyze, but are still well within sight of the line of health. Such are the common diseases of the organs and systems—the inflammations, catarrhs, degenerations, hypertrophies, and functional derangements without lesion of the respiratory, circulatory, nervous, genito-urinary, locomotor, and cutaneous systems. Constitutional or general diseases belong also to the province of perturbations from the physiological course—such diseases as chlorosis, leukæmia, diabetes, gout, rheumatism, scurvy, rickets, Addison's disease, exophthalmic goitre, and the febrile state. Again, congenital deficiencies or malformations, non-cancerous tumors, and the repairing of injuries exemplify no other laws than those of development and growth.

But with those examples the catalogue of physiologi-

cal diseases is exhausted. We are left with a vast residue of diseases, which have always bulked largely in the popular mind, and have carried the most terrible associations with them. Such are the pestilences or diseases of peoples—the plague, sweating sickness, cholera, yellow fever, typhus fever, relapsing fever, typhoid fever, diphtheria, smallpox, measles, scarlet fever, influenza, dengue. Such also are the cancers, consumptions, leprosy, and other loathsome infections. This enormous residue is more than the half of disease, and the definition of disease or the scheme of pathology is brought to a test in finding room within its scientific categories for such maladies as those. The popular imagination in all countries has personified them; medicine in its metaphysical period has regarded them as entities or things in themselves; and it remains to be seen in what way or to what extent medicine in its scientific period will bring them within the category of perturbations of the physiological life.

In considering, for a moment, where to place cancer in the pathological scheme, we shall arrive at a point of view from which the relation of the acute and chronic infections (or contagions) to diseases of the physiological order may be contemplated at least provisionally. Taking cancers, in a generic sense, to mean tumors that have acquired or are possessed of malignancy, we find that such tumors have many points in common with simple tumors—that they have grown out of the tissues of particular organs or parts under particular (functional) circumstances, and that they may, in general terms, be traced back to that point at which they left the line of health (see *PATHOLOGY*). The tracing back of tumors along the physiological track is often difficult and laborious; but there is no tumor of the body whose origins are not at length discoverable within the limits of physiological action. That which makes any tumor a cancer is something over and beyond; it is a remarkable acquired property of reproducing its structure in manifold copies, or of infecting the organism of which it is itself a part. The tumor thus becomes a semi-dependent power within the body; it may be said, in a political figure, to have acquired *autonomy*, or to have become *imperium in imperio*. A due consideration of such a phenomenon as the infectiveness or cancerousness of some tumors will satisfy one that there are concepts in pathology which carry the investigator entirely beyond physiological bounds or out of sight of the line of health, which bring him face to face with the notion of a disease as a thing in itself, and which thus constitute a peculiar subject-matter. There is nothing that we know among biological phenomena altogether analogous to the semi-independence which an integral part of the body, or condition of the body, manifests toward the organism as a whole, and that, too, strictly in respect of its acquired devious or rebellious habit. The familiar definition of disease, *morbus est vita præter naturam*, which embodies the notion of divergence from the line of health, makes no provision for any acquired autonomy of a morbid state; and that definition has to be supplemented by another, which will recognize the possibility of a disease becoming a thing in itself. The old definition of Van Helmont, *morbus est ens reale subsistens in corpore*, appears to satisfy the requirement; but that definition, although it grew out of the phenomena of disease as observed in fevers, was made too general, and has now associations that are too exclusively ontological and metaphysical. The supplementary definition should be as far as possible in the terms of the principal definition; and we shall provide best in the pathological scheme for such a disease as cancer if, in addition to the formula *morbus est vita præter naturam*, we construct a secondary formula, *morbus est vivum in vivo*.

The notion of autonomy acquired by a morbid state implies, naturally, a pre-autonomous stage of the disease, which had been a mere perturbation of the norm of the body, capable of being measured by the physiological standard. The autonomous stage and the pre-autonomous stage, which may be demonstrated, in individual cases, for cancers, are a philosophical necessity for all other infective diseases that are marked by morphological features, or by structural characters rooted in and growing out of the proper textures of the body. Thus the peculiar skin eruption of smallpox, which is communicable from person to person, along with a distinctive course of fever, must have had pre-autonomous antecedents (not altogether historically vague) in certain casual conditions of the skin and associated constitutional disturbance, which had recurred and become inveterate, and had so attained to a degree of individuality or a point of autonomy at which they began to be propagated as an organic unit. Again, a second group of infections, exemplified by glanders, bovine tubercle, and syphilis, are rooted in deeper textural processes, which must have been at one time (and may still be) set up by the casual operation of ordinary causes, and at length became the occasion of infective mimicry. It is not so easy to picture (and it is not difficult, with a modern dominant school, to ignore) the casual morbid conditions or ordinary physiological perturbations out of which powerful infections like cholera, typhoid fever, or yellow fever may have arisen; but if the rise and consolidation of their autonomy be a subtle or even untraceable history, yet there are diseases, such as dysentery and erysipelas, which are apt to occur both as casual or spontaneous conditions and as specific infections side by side. Ophthalmia is an example of a purulent catarrh which is constantly arising *de novo* in Egypt from local causes in a non-infective manner, and yet has become, on at least one memorable occasion, a powerful and wide-spread infection for British troops returning from that country and for the home garrisons for many years subsequently. Infective pneumonia in cattle, and more rarely in man, is an analogous case. In such an episode we observe the actual rise of the disease-autonomy. Again, all the infective diseases have degrees of intensity, at one extreme of which there must occur the vanishing point of their infective property; and those gradations of infectiveness are nowhere more noticeable than in the relation of cholera to choleraic diarrhoea. Further, the remarkable group of climatic fevers are not communicable from person to person (see MALARIA); in that respect, and for the reason that the liability of the patient is anything but exhausted by one attack, they are examples of fevers without autonomy. There is not one of the infections that may not be profitably studied from the point of view of its autonomy, and of its more or less obscure pre-autonomous stage. That is a point of view from which even the pestilences and other specific diseases may be regarded as coming within the physiological categories. The large residue of diseases, which are more than perturbations of the physiological life, may still be joined by natural descent to the class of simple perturbations, if we can show for them how their autonomy was acquired, or what was their origin as disease-species.

There is an established place in the history of medicine, and there ought therefore to be room in the definition of disease, for epidemic outbreaks of purely psychical diseased states, such as the dancing madness (*Tanzwuth*), and the boys' crusades; the epidemic diffusion of such morbid states is best approached from the point of view of an acquired autonomy (fixed idea) and an infective mimicry.

The physiological definition of disease, *morbus est*

vita præter naturam, affords no place for parasitic diseases. However, the supplementary formula that has been proposed to meet the cases of diseases existing autonomously in the body, *morbus est vivum in vivo*, will meet the case of parasitic diseases also. According to many pathologists of the present generation, the whole class of pestilences, fevers, and specific infections generally are caused by certain species of minute parasites invading the body; according to one form of that hypothesis the distinctive characters or specific marks (morphological and other) of those diseases are neither more nor less than the appropriate effects wrought upon the textures and fluids of the body by the respective species of parasites. In this way the great group of infective diseases, which are apt to be the stumbling-block of a scientific definition and logical scheme of disease, are easily disposed of by placing them beside the otherwise insignificant group of parasitic diseases. Whether all or any of those diseases are due in a sense to the invasion of parasites, or wholly caused by parasites, are questions that naturally fall to be settled by a careful sifting of a mass of evidence which has already proved to be peculiarly rich in opportunities for mistake. It may be expected that the facts of infective parasitism and the facts of acquired disease-autonomy will in the end find their place in a common theory of specific diseases, which might be expressed in terms of the physiological formula *morbus est vita præter naturam* with the rider *morbus est vivum in vivo*.

The theory of remedies, which forms the second division of the science of medicine, is chiefly based on pharmacology or toxicology. If pharmacology be considered as not coextensive with toxicology, it will be taken to be in great part pharmacographia, or the systematic description of articles of materia medica—their source, preparation, physical properties, and the like. Toxicology is in its general sense the investigation of the physiological action of drugs, a science which is largely dependent upon experiments on the lower animals; in a more technical sense toxicology relates to the effect of poisons and the art of detecting them (see POISONS). The physiological action of drugs is the key to their therapeutical action. Therapeutics has been defined as "the discovery of the means by which a system of forces competent to eliminate any given perturbation may be introduced into the economy." The adaptation of remedies to diseases is, however, greatly wanting in precision, and continues to be in large part empirical and traditional. It may be objected to the above definition that all diseases are not reducible to the category of "perturbations," and that there is a certain scientific justification for the doctrine of specifics. Besides the articles of the materia medica proper, agencies such as electricity, baths, sea-voyages, and changes of climate generally, enter into the consideration of therapeutics, and two of those form the subject of special departments, viz., electro-therapeutics and hydrotherapy. Regimen and diet are also important factors in the treatment of disease; according to a contention of Hippocrates, it was in the dietetic needs of mankind that the medical art had its origin.

History.—In the state of society pictured by Homer it is clear that medicine has already had a history. We find a distinct and organized profession; we find a system of treatment, especially in regard to injuries, which it must have been the work of long experience to frame; we meet with a nomenclature of parts of the body substantially the same as that employed long afterward in the writings of Hippocrates; in short, we find a science and an organization which, however imperfect as compared with those of later times, are yet very far from being in their beginning.

It is only from non-medical writers that anything is known of the development of medicine in Greece before the age of Hippocrates.

The grand characteristic of Hippocratic medicine is the singular artistic skill and balance with which the Hippocratic physician used such materials and tools as he possessed.

The actual science of the Hippocratic school was, of course, very limited. In anatomy and physiology little advance had been made, and so of pathology in the sense of an explanation of morbid processes or knowledge of diseased structures there could be very little. The most valuable intellectual possession was a large mass of recorded observations in individual cases and epidemic diseases. Whether these observations were systematic or individual, and how they were recorded, are points of which we are quite ignorant.

Though the Hippocratic medicine was so largely founded on observation, it would be an error to suppose that dogma or theory had no place. The dominating theory of disease was the *humoral*, which has never since ceased to influence medical thought and practice. According to this celebrated theory, the body contains four humors—blood, phlegm, yellow bile, and black bile—a right proportion and mixture of which constitute health; improper proportions or irregular distribution, disease. Another Hippocratic doctrine, the influence of which is not even yet exhausted, is that of the healing power of nature. Not that Hippocrates taught, as he was afterward reproached with teaching, that nature is sufficient for the cure of diseases; for he held strongly the efficacy of art. But he recognized, at least in acute diseases, a natural process which the humors went through—being first of all *crude*, then passing through *coction* or digestion, and finally being expelled by resolution or *crisis* through one of the natural channels of the body. The duty of the physician was to foresee these changes, "to assist or not to hinder them," so that "the sick man might conquer the disease with the help of the physician." The times at which crises were to be expected were naturally looked for with anxiety; and it was a cardinal point in the Hippocratic system to foretell them with precision. *Prognosis*, or the art of foretelling the course and event of the disease, was a strong point with the Hippocratic physicians. In this they have perhaps never been excelled. Diagnosis, or recognition of the disease, must have been necessarily imperfect, when no scientific nosology, or system of disease, existed, and the knowledge of anatomy was quite inadequate to allow of a precise determination of the seat of disease; but symptoms were no doubt observed and interpreted skillfully.

The century after the death of Hippocrates is a time almost blank in medical annals. It is probable that the science, like others, shared in the general intellectual decline of Greece after the Macedonian supremacy; but the works of physicians of the period are almost entirely lost, and were so even in the time of Galen.

The dispersion of Greek science and intellectual activity through the world by the conquests of Alexander and his successors led to the formation of more than one learned center, in which medicine among other sciences was represented. Pergamum was early distinguished for its medical school; but in this as in other respects its reputation was ultimately effaced by the more brilliant fame of Alexandria. It is here that the real continuation and development of Hippocratic medicine can be traced.

Two eminent names stand in the first rank as leaders of the two earliest schools of medicine which arose in Alexandria, Herophilus and Erasistratus.

The Erasistrateans paved the way for what was in some respects the most important school which Alexandria produced, that known as the empiric, which, though it recognized no master by name, may be considered to have been founded by Philinus of Cos (280 B.C.), a pupil of Herophilus; but Serapion, a great name in antiquity, and Glaucias of Tarenton, who traced the empirical doctrine back to the writings of Hippocrates, are also named among its founders. The most striking peculiarity of the empirics was that they rejected anatomy, regarding it as useless to inquire into the causes of things, and thus, as they contended, being the more minute in their observation of the actual phenomena of disease. They professed that their whole practice was based upon experience, to which word they gave a special meaning. Three sources, and three only, could experience draw from—observation, history (*i.e.*, recorded observation), and judgment by analogy. These three bases of knowledge were known as the "tripod" of the empirics.

If we look at the work of the Alexandrian schools in medicine as a whole, we must admit that the progress made was great and permanent. The greatest service rendered to medicine was undoubtedly the systematic study of anatomy.

The Romans cannot be said to have at any time originated or possessed an independent school of medicine. They had from early times a very complicated system of superstitious medicine, or religion, related to disease and the cure of disease, borrowed, as is thought, from the Etruscans; and, though the saying of Pliny that the Roman people got on for six hundred years without doctors was doubtless an exaggeration, and not, literally speaking, exact, it must be accepted for the broad truth which it contains. When a medical profession appears, it is, so far as we are able to trace it, as an importation from Greece.

Although no system or important doctrine of medicine was originated by the Roman intellect, and though the practice of the profession was probably almost entirely in the hands of the Greeks, the most complete picture which we have of medical thought and activity in Roman times is due to a Latin pen, and to one who was, in all probability, not a physician, A. Cornelius Celsus.

We now come to the writer who, above all others, gathered up into himself the divergent and scattered threads of ancient medicine, and out of whom again the greater part of modern European medicine has flowed. Galen was a man furnished with all the anatomical, medical, and philosophical knowledge of his time; he had studied all kinds of natural curiosities, and had stood in near relation to important political events; he possessed enormous industry, great practical sagacity, and unbounded literary fluency.

Galen was as devoted to anatomical and, so far as then understood, physiological research as to practical medicine. He worked enthusiastically at dissection, though, the liberty of the Alexandrian schools no longer existing, he could dissect only animals, not the human body. In his anatomical studies Galen had a twofold object—a philosophical, to show the wisdom of the Creator in making everything fit to serve its purpose, and a practical, to aid the diagnosis, or recognition, of disease. The first led him into a teleological system so minute and overstrained as to defeat its own end; the second was successfully attained by giving greater precision and certainty to medical and surgical practice in difficult cases.

The Byzantine school of medicine, which closely corresponds to the Byzantine literary and historical schools, followed closely in Galen's footsteps, and its writers were chiefly compilers and encyclopedists.

In the West the period after Galen affords little evidence of anything but a gradual though unvarying decline in Roman medicine.

The rise of the Mohammedan empire, which influenced Europe so deeply both politically and intellectually, made its mark also in the history of medicine. As in the parallel case of the Roman conquest of Greece, the superior culture of the conquered race asserted its supremacy over their Arab conquerors. After the Mohammedan conquests became consolidated, and learning began to flourish, schools of medicine, often connected with hospitals and schools of pharmacy, arose in all the chief seats in Moslem power. At Damascus Greek medicine was zealously cultivated with the aid of Jewish and Christian teachers. In Bagdad, under the rule of Hārūn el Rashīd and his successors, a still more flourishing school arose, where numerous translations of Greek medical works were made.

AVICENNA (*q.v.*) has always been regarded as the chief representative of Arabian medicine. The work by which he is chiefly known, the celebrated "canon," is an encyclopædia of medical and surgical knowledge, founded upon Galen, Aristotle, the later Greek physicians, and the earlier Arabian writers, singularly complete and systematic, but is thought not to show the practical experience of its author.

In medical as in civil history there is no real break. A continuous thread of learning and practice must have connected the last period of Roman medicine already mentioned with the dawn of science in the Middle Ages. The chief homes of medical as of other learning in these disturbed times were the monasteries. The study of Hippocrates, Galen, and other classics was recommended by Cassiodorus (sixth century), and in the original mother-abbey of Monte Cassino medicine was studied; but there was not there what could be called a medical school; nor had this foundation any connection (as has been supposed) with the famous school of Salerno.

The origin of this, the most important source of medical knowledge in Europe in the early Middle Ages, is involved in obscurity. It is known that Salerno, a Roman colony, in a situation noted in ancient times for its salubrity, was in the sixth century at least the seat of a bishopric, and at the end of the seventh century of a Benedictine monastery, and that some of the prelates and higher clergy were distinguished for learning, and even for medical acquirements. In the ninth century Salernitan physicians were already spoken of, and the city was known as *Civitas Hippocratica*. A little later we find great and royal personages resorting to Salerno for the restoration of their health, among whom was William of Normandy, afterward the Conqueror. The reputation of the school was great till the twelfth or thirteenth century, when the introduction of the Arab medicine was gradually fatal to it. The foundation of the university of Naples, and the rise of Montpellier, also contributed to its decline.

About the middle of the eleventh century the Arabian medical writers began to be known by Latin translations in the Western world. It is needless to point out the influence of the crusades in making Eastern ideas known in the Western world. The influence of Arabian medicine soon began to be felt even in the Hippocratic city of Salerno, and in the thirteenth century is said to have held an even balance with the older medicine. After this time the foreign influence predominated; and by the time that the Aristotelian dialectic, in the introduction of which the Arabs had so large a share, prevailed in the schools of Europe, the Arabian version of Greek medicine reigned supreme in the medical world.

The supremacy of Arabian medicine lasted till the

revival of learning, when the study of the medical classics in their original language worked another revolution. The medical writers of this period, who chiefly drew from Arabian sources, have been called Arabists (though it is difficult to give any clear meaning to this term), and were afterward known as the neoterics.

The impulse which all departments of intellectual activity received from the revival of Greek literature in Europe was felt by medicine among the rest.

Two of the most important results of the revival of learning were indeed such as are excluded from the scope of this brief sketch, namely, the reawakening of anatomy, which to a large extent grew out of the study of the works of Galen, and the investigation of medicinal plants, to which a fresh impulse was given by the revival of Dioscorides and other ancient naturalists. The movement of reform started, of necessity, with scholars rather than practicing physicians—more precisely with a group of learned men, whom we may be permitted, for the sake of a name, to call the medical humanists, equally enthusiastic in the cause of letters and of medicine. From both fields they hoped to expel the evils which were summed up in the word barbarism. Nearly all mediæval medical literature was condemned under this name; and for it the humanists proposed to substitute the originals of Hippocrates and Galen, thus leading back medicine to its fountain-head.

In another direction the foundations of modern medicine were being laid during the sixteenth century, namely, by the introduction of clinical instruction in hospitals. In this Italy, and especially the renowned school of Padua, took the first step, where De Monte (Montanus), gave clinical lectures on the patients in the hospital of St. Francis, which may still be read with interest.

The medicine of the early part of the seventeenth presents no features to distinguish it from that of the preceding century. The practice and theory of medicine were mainly founded upon Hippocrates and Galen, with ever-increasing additions from the chemical school. But the development of mathematical and physical science soon introduced a fundamental change in the habits of thought with respect to medical doctrine.

The dominant factors in the seventeenth century medicine were the discovery of the circulation by Harvey (published in 1628), the mechanical philosophy of Descartes and the contemporary progress of physics, the teaching of Van Helmont and the introduction of chemical explanations of morbid processes, and finally, combined of all these, and inspiring them, the rise of the spirit of inquiry and innovation, which may be called the scientific movement.

At the same time the discovery of new diseases, unknown to the ancients, and the keener attention which the great epidemics of plagues caused to be paid to those already known, led to more minute study of the natural history of disease.

The medicine of the eighteenth century is notable, like that of the latter part of the seventeenth, for the striving after complete theoretical systems. At this time a galaxy of great names appears on the roll of medical teachers.

Hermann Boerhaave (1668–1738) was emphatically a great teacher. He was for many years professor of medicine at Leyden, where he lectured five hours a day, and excelled in influence and reputation, not only his greatest forerunners, Montanus of Padua and Sylvius of Leyden, but probably every subsequent teacher. The hospital of Leyden, though with only twelve beds available for teaching, became the center of medical influence in Europe. Many of the leading English physicians of the eighteenth century studied there; Van Swieten, a pupil of Boerhaave, transplanted the latter's

method of teaching to Vienna, and founded the noted Vienna school of medicine. As the organizer, and almost the constructor, of the modern method of clinical instruction, the services of Boerhaave to the progress of medicine were immense, and can hardly be overrated. In his teaching, as in his practice, he avowedly followed the method of Hippocrates and Sydenham, both of whom he enthusiastically admired.

Friedrich Hoffmann (1669-1742), like Boerhaave, owed his influence, and perhaps partly his intellectual characteristics, to his academical position. He was, in 1693, appointed the first professor of medicine in the university of Halle, then just founded by the elector Frederick III. Here he became, as did his contemporary and rival, Stahl, a popular and influential teacher, though their university had not the European importance of Leyden. Hoffmann's "system" was apparently intended to reconcile the opposing "spiritual" and "materialistic" views of nature, and is thought to have been much influenced by the philosophy of Leibnitz.

George Ernest Stahl (1660-1734) was for more than twenty years professor of medicine at Halle, and thus a colleague of Hoffmann, whom he resembled in constructing a complete theoretical system, though their systems had little or nothing in common. Stahl's chief aim was to oppose materialism.

Albrecht von Haller (1708-77) was a man of even more encyclopaedic attainments than Boerhaave. He advanced chemistry, botany, anatomy, as well as physiology, and was incessantly occupied in endeavoring to apply his scientific studies to practical medicine, thus continuing the work of his great teacher Boerhaave. Besides all this he was probably more profoundly acquainted with the literature and bibliography of medicine than anyone before or since.

The work of Giovanni Battista Morgagni (1682-1771) had and still preserves a permanent importance beyond that of all the contemporary theorists.

William Cullen (1712-90) was a most eminent and popular professor of medicine at Edinburgh. The same academical influences as surrounded the Dutch and German founders of systems were doubtless partly concerned in leading him to form the plan of a comprehensive system of medicine. Cullen's system was largely based on the new physiological doctrine of irritability, but is especially noticeable for the importance attached to nervous action.

It is difficult to form a clear estimate of the importance of the last systematizer of medicine, John Brown (1735-88), for, though in England he has been but little regarded, the wide though short-lived popularity of his system on the Continent shows that it must have contained some elements of brilliancy, if not originality.

Before the theoretic tendency of the eighteenth century was quite exhausted, it displayed itself in a system which, though in some respects isolated in the history of medicine, stands nearest to that of Brown—that, namely, of Hahnemann (see HOMŒOPATHY). Hahnemann (1753-1844) was in conception as revolutionary a reformer of medicine as Paracelsus. He professed to base medicine entirely on a knowledge of symptoms, regarding all investigation of the causes of symptoms as useless. While thus rejecting all the lessons of morbid anatomy and pathology, he put forward views respecting the causes of disease which hardly bear to be seriously stated.

In looking back on the repeated attempts in the eighteenth century to construct a universal system of medicine, it is impossible not to regret the waste of brilliant gifts and profound acquirements which they involved. It was fortunate, however, that the accumulation of positive knowledge in medicine did not cease.

While Germany and Scotland, as the chief homes of abstract speculation, gave birth to most of the theories, progress in objective science was most marked in other countries—in Italy first, and afterward in England and France.

One novelty, however, of the first importance, is due to a Vienna physician of the period, Leopold Avenbrugger (1722-1809), the inventor of the method of recognizing disease in the chest by percussion. Avenbrugger's method was that of *direct* percussion with the tips of the fingers, not that which is now used, of *mediate* percussion with the intervention of a finger or plessimeter; but the results of his method were the same, and its value nearly as great.

It is not possible to carry the history of medicine, in a sketch such as this, beyond the early years of the nineteenth century, both because the mass of details becomes so large as to require more minute treatment, and because it is difficult as we approach our own times to preserve the necessary historical perspective. It was, however, in this period that what we regard as the modern school of medicine was formed, and took the shape which it has preserved to our own days. The characteristic of the modern school is the adoption in medicine of the methods of research of physical science, and the gradually declining importance attached to theory and abstract reasoning—hypotheses, though not neglected, being used as means of research rather than as ultimate conclusions. Its method may therefore be called the positive method, or that of rational empiricism. The growth of the new school was first seen in two European countries, in France and England. Germany entered the field later. In the United States the science of medicine has kept pace with all other branches of knowledge, and no country boasts of more successful teachers and practitioners or more daring and original investigators.

MEDINA, or rather EL-MEDINA (the city), or MEDINAT RASUL ALLAH (the city of the apostle of God), a town of Hijáz in Arabia, the refuge of Mohammed on his flight from Mecca, and a renowned place of Moslem pilgrimage, consecrated by the possession of his tomb. The name El-Medina goes back to the Koran; the old name was Yathrib, the Lathrippa of Ptolemy and Iathrippa of Stephanus Byzantius. Pop., 48,000.

MEDINA, a New York town, of Orleans county, has several manufacturing establishments, numerous churches, schools, etc. It has banks, railroad connections, and telegraphs. Near by are extensive quarries which furnish good building stone. Population (1900), 4716.

MEDINA SIDONIA, a town of Spain, in the province of Cadiz, and about twenty-one miles by road westward from that city, stands at a height of 600 feet above the sea-level, on an isolated hill surrounded by a cultivated plain. The population in 1899 was 13,234.

MEDITERRANEAN SEA. The southern shores of Europe are separated from the northern shores of Africa by the Mediterranean Sea. The length of this body of water from Gibraltar to its eastern extremity in Syria is about 2,100 miles. Its breadth is very various, being 400 miles from the mouth of the Rhone to the Algerian coast, 500 miles from the Gulf of Sidra to the entrance to the Adriatic, and 250 miles from the mouth of the Nile to the south coast of Asia Minor. From the very indented nature of its coasts, the general mass of the water is much cut up into separate seas, which have long borne distinctive names, as the Adriatic, the Ægean, the Sea of Marmora, the Black Sea, etc. The area of the whole system, including the Sea of Azoff, is given as 1,149,287 square miles. If we deduct that of the Black Sea and Sea of Azoff, 172,506 square miles,

we have for the area of the Mediterranean proper 976,781, or, roughly speaking, a million of square miles.

The Mediterranean is sharply divided into two great principal basins, the western and the eastern or Levant basin. The western possesses a comparatively smooth and unindented coast-line. It is bounded on the south by the coast of Africa and the north coast of Sicily, and it is further inclosed by the coasts of Spain, France, and Italy, which form a roughly arc-shaped coast-line. There are comparatively few small islands in this basin, though some of the more important large ones occur in it. The eastern basin is by far the larger of the two, and extends from Cape Bon to the Syrian coast, including as important branches the Adriatic and the Ægean. The latter is connected directly, through the Hellespont, the Sea of Marmora, and the Bosphorus, with the Black Sea. The entrance to the western basin and to the sea generally from the ocean is through the Straits of Gibraltar. The greatest depth on the shallowest ridge reaching from the African to the Sicilian coast is under 200 fathoms, and agrees very closely with the corresponding depth at the entrance of the Straits of Gibraltar.

So far as is at present known, the maximum depth is pretty nearly alike in the two basins, being 2,040 fathoms in the western, and 2,150 fathoms in the eastern.

The deepest water of the Mediterranean is found in the widest part between Malta and Crete, and the deep water comes close up to the Italian and Greek coasts, while on the African shore the water shoals more gradually. There is authentic historical evidence of the encroachment of the Italian shores on the Adriatic, causing thereby a diminution of its area. As a consequence many towns which were once thriving seaports are now many miles inland; thus Adria, which was a station of the Roman fleet, is now fifteen miles inland, and there are many similar examples. The large rivers, Po and Adige, which bring the drainage of the southern slopes of the Alps to the sea, deliver large quantities of sediment in the course of the year. The distribution of this mud is affected, not only by its own weight tending to make it sink to the bottom, but also by the set of the currents, which, running up the eastern coast, turn to the westward and southward at the upper end of the sea, and so tend to distribute the river mud along the bottom in the neighborhood of the Italian coasts. The fact that towns which were formerly seaports are now inland does not, therefore, necessitate the assumption of a general rise of the land, it is merely a reclamation by natural agencies of land from the sea at the expense of the inland mountainous country. Precisely similar phenomena are observed in the neighborhood of the mouths of the Rhone and of the Nile.

The water of the Mediterranean proper is very much saltier than either the Atlantic on the west or the Black Sea on the east, and this great density of the water affords a useful means of recognizing it when investigating the interchange of waters which takes place at the two extremities of the sea. Both the temperature and the specific gravity of the water are evidences of the local climate. The great concentration of the water shows how dry the atmosphere at the surface must be, and how insignificant the contributions of fresh water. That the level and the salinity of the Mediterranean remain constant is due to the supply of water which enters at the Straits of Gibraltar. The currents in this passage have frequently engaged attention both from their scientific and from their nautical interest.

The mean temperature of the water of the Mediterranean at a depth of 100 fathoms or more has been found to be between 56° and 57° Fahr. This result was obtained by several expeditions making surveys, all using different methods and instruments.

The great value of such a volume of water as an equalizer of temperature on its shore must be apparent, though in this respect it is inferior to the Atlantic Ocean in its immediate neighborhood. Places on the west coast of Spain and Portugal have a much higher winter temperature and lower summer temperature than places in the same latitude in Italy. The reason of this is simple: on the Atlantic coast the principal winds in winter are from the southwest, and have a warming effect, while in summer the source of the northeast trade winds is pushed back into the Bay of Biscay, causing in this season constant northerly winds along the coast of Portugal. The winds of the Mediterranean have no seas of remote latitudes to draw on for either heating or cooling purposes, though the sandy deserts of Africa which bound its southern coasts have at certain seasons a very decided influence on the climate. The tempering action of the sea does not extend very far inland, as is evident from the climate of inland towns in Italy.

MEDLAR, *Mespilus Germanica*, L., of the tribe *Pomœe* of the order *Rosaceæ*, regarded by Bentham and Hooker as a subgenus of *Pyrus*, is a native of European woods, etc., from Holland southward, and of western Asia. The medlar was well known to the ancients. The well-known fruit is globular, but depressed above, with leafy persistent sepals, and contains stones of a hemispherical shape. It is not fit to eat until it begins to decay.

MÉDOC is the name given to the district in France adjoining the left bank of the Gironde from Ambès, the point where the Garonne and Dordogne unite, to Lesparre; a fifth part of its soil is occupied by vineyards, the products of which form the finest growths of Bordeaux. Of these the most esteemed are Château-Margaux, Château-Lafitte, and Château-Latour.

MÉDUSA. See GORGON. See also HYDROZOA.

MEDYN, a district town of Russia, situated in the government of Kaluga, thirty-nine miles northwest of the capital of the province, on the highway from Moscow to Warsaw.

MEER, JAN VAN DER, of Delft—not to be confounded with the elder or younger Van der Meer of Haarlem or with Van der Meer of Utrecht—is one of the excellent painters of Holland about whom the Dutch biographers give us little information. Van der Meer, or Vermeer, by which name he is also known, was born in Delft in 1632. In 1653 he married Catherine Bolenes, and in the same year he entered the guild of St. Luke of Delft, becoming one of the heads of the guild in 1662, and again in 1670. He died at Delft in 1675, leaving a widow and eight children.

MEERANE, a rapidly increasing industrial town in southeastern Saxony, lies in the district of Zwickau, about thirty-seven miles to the south of Leipsic. The population in 1900 was 23,851.

MEERSCHAUM. This German name is applied to a certain mineral, in consequence of its lightness, softness, and white color, which suggest a resemblance to "sea-foam." By the German mineralogist Glocker it was termed *sepiolite*, in allusion to its resemblance to the so-called bone of the sepia or cuttle-fish. Possibly the fact that pieces of meerschaum, washed out of their matrix, are occasionally found floating on the Black Sea, may have led to the association of the mineral with marine products. Meerschaum is an opaque earthy mineral, of white, grayish, or yellowish color, compact in texture, and breaking with a conchoidal or fine earthy fracture; it adheres to the tongue and is so soft as to be scratched by the nail. Its specific gravity varies from 0.988 to 1.279; hence it floats in sea-water until saturated. Meerschaum is a hydrated silicate of mag

nesium. Most of our meerschaum comes from Asia Minor, especially from the plains of Eski-shehr, where it occurs in nodular masses, of variable size and irregular shape, distributed through the alluvial deposits of the plain, which are systematically worked for its extraction by means of pits and galleries.

By far the greatest quantity of meerschaum is used in the manufacture of tobacco-pipes, a purpose for which it is well fitted by its porosity.

MEERUT, or MIRATH, a district in the division of Meerut and the lieutenant-governorship of the North-western Provinces, India. The area in 1901 was given as 2,361 square miles. Population, 1,700,000.

MEERUT, a city and cantonment in the above district, is situated about half way between the Ganges and the Jumna. The city proper lies south of the cantonments, and although a very ancient town, dating as far back as the days of the Buddhist emperor Asoka (*circa* 250 B.C.), Meerut owes its modern importance to its selection by the British Government as the site of a great military station. Pop. (1901), 116,642.

MEGALOPOLIS, a city of southern Arcadia, situated in a plain about twenty miles southwest of Tegea, on both banks of the Helisson, about two and one-half miles above its junction with the Alpheus. It was fifty stadia in circumference, and was surrounded with strong walls. Its territory was the largest in Arcadia, extending northward twenty-four miles. The city was built on a magnificent scale, and adorned with many handsome buildings, both public and private.

MEGALOSAURUS. See REPTILES.

MEGAPODE, the name given generally to a small but remarkable family of birds, highly characteristic of some parts of the Australian region, which morphologically seem to be the lowest of the order, with which apparent fact may perhaps be correlated their singular habit of leaving their eggs to be hatched without incubation, burying them in the ground (as many reptiles do) or heaping over them a mound of earth, leaves, and rotted wood. The Australian bird is of a sooty-brown color, relieved beneath by the lighter edging of some of the feathers, but the head and neck are nearly bare, beset with fine bristles, the skin being of a deep pinkish-red, passing above the breast into a large wattle of bright yellow. The tail is commonly carried upright and partly folded, something like that of a domestic fowl.

The next form of which we may speak is another inhabitant of Australia, commonly known in England as the Mallee-bird, but to the colonists as the "Native Pheasant," which has much shorter tarsi and toes, the head entirely clothed, and the tail expanded. Its plumage presents a pleasing combination of grays and browns of various tints, interspersed with black, white, and buff, the wing coverts and feathers of the back bearing each near the tip an oval or subcircular patch, while a stripe of black feathers with a median line of white extends down the front of the throat, from the chin to the breast.

Of the Megapodes proper, constituting the genus *Megapodius*, many species have been described, but authorities are greatly at variance as to the validity of several, and here it would be impossible to name all that have been supposed to exist. Some are only known from very young examples—mere chickens; and some have even been described from their eggs alone.

MEGARA was the name of two Greek towns, one in Sicily, which has been already described under HYBLA, the other on the road from Attica to Corinth. The town was one of the most important commercial and colonizing centers of Greece in early times, and there is no doubt that its trade, like that of Corinth, owed its

origin to the Phœnicians, who found its situation on the isthmus convenient.

The situation of Megaris on the isthmus gave it great political power, inasmuch as it commanded all the roads from the Peloponnesus into continental Greece; and so long as the people continued united under an orderly government they maintained their high position. The city maintained a flourishing existence throughout the Greek and Roman periods, but played a very subordinate part in history. In the unsettled time when the Roman empire had decayed, it was often plundered by pirates.

MEGATHERIUM is the name given by Cuvier to a large extinct animal belonging to the order *Edentata*.

The following description will apply especially to the best-known South American form, *Megatherium americanum*. In size it exceeded any existing land animal except the elephant, to which it was inferior only in consequence of the comparative shortness of its limbs, for in length and bulk of body it was its equal, if not superior. The full length of a mounted skeleton from the fore part of the head to the end of the tail is eighteen feet, of which the tail occupies five feet. The head, which is small for the size of the animal, presents a general resemblance to that of the sloth. In number the teeth exactly resemble those of the sloths, being five above and four below on each side, and they are limited to the lateral parts of the mouth, front teeth being entirely wanting. The vertebral column consists of seven cervical, sixteen dorsal, three lumbar, five sacral, and eighteen caudal vertebrae.

The tail is large, and its basal vertebrae have strong lateral and spinous processes and chevron bones, indicating great muscular development. The clavicle is complete and very large, much resembling that of man on a large scale. The fore limbs are longer than the hind limbs. The radius and ulna are both well developed, and have a considerable amount of freedom of movement. The hand is singularly modified. The first digit is represented only by a rudimentary metacarpal, but the next three are large, and terminate in phalanges adapted for the support of immense claws, the middle one being especially large. The outer or fifth digit has no claw, and it may be considered as certain that the weight of the foot was, in standing and walking, chiefly thrown upon this, and that it was protected by a callous pad below, as in the existing great anteater, while the other toes were curved inward toward the palm, only coming in contact with the ground by their outer surfaces. The pelvis is remarkably wide, even more so than that of the elephant, but it is formed on the same principle as in the sloths. The femur is extremely broad and flattened; the tibia and fibula are short and strong, and united together at each end. The hind foot, contrary to the usual rule in the *Edentata*, is even more singularly modified than the hand. The ankle-joint is formed upon a peculiar plan quite unlike that of the sloths, or of any other mammal, except the Megatherium's nearest allies. The calcaneum projects nearly as far backward as the forepart of the foot does forward. There is no trace of great toe or hallux, or of its corresponding uniform bone. The second toe is rudimentary. The third has an enormous ungual phalanx, which, like those of the hand, is remarkable for the immense development of the bony sheath which is reflected from its proximal end around the base of the claw. The two outer toes have large and very peculiarly-shaped metatarsals, but only small phalanges, and no claws. The creature probably walked upon the outer edges of the sole, so that the great falcate claw of the third toe did not come into contact with the ground, and so was kept in a state of

sharpness ready for use. The foot was therefore formed upon quite a different principle from that of the anteaters or sloths, though somewhat like the latter in having two of the toes aborted.

Taking all the various points of its structure together, they clearly indicate affinities both with the existing sloths and with the anteaters, the skull and teeth more resembling those of the former, and the vertebral column and limbs the latter. It is not difficult to infer the food and habits of this enormous creature. That it was a leaf-eater there can be little doubt, but the greater size and more complex structure of its teeth might have enabled it to crush the smaller branches as well as the leaves and succulent shoots which form the food of the existing sloths. It is, however, very improbable that it climbed into the branches of the trees like its diminutive congeners, but it is far more likely that it obtained its subsistence by tearing them down with the great hook-like claws of its powerful prehensile fore limbs, being easily enabled to reach them by raising itself up upon the massive tripod formed by the two hind feet, firmly fixed to the ground by the one huge falcate claw, and the stout, muscular tail. The whole conformation of the hinder part of the animal is strongly suggestive of such an action. There can also be little doubt but that all its movements were as slow and deliberate as those of its modern representatives.

MEGHNA, a river of India, forming, in the lower part of its course, the great estuary of the Bengal delta, which conveys to the sea the main body of the waters of the Ganges and the Brahmaputra, which unite at Góalánda in Faridpur district. The river enters the sea by four principal mouths, inclosing the three large islands of Dakshin Shábazpur, Hatia, and Sandwip. It is navigable by native boats of the largest burden, and also by river steamers, all the year through; but the navigation is difficult, and sometimes dangerous, on account of shifting sand-banks and "snags," and boisterous weather when the monsoon is blowing.

MEHÁDIA, a market-town in the county of Szörény, Hungary, is situated on the Bella-Reka, or Bereka, thirteen and a half miles north of Orsova. Mehádía is chiefly of importance as the station for the Hercules Baths, distant about three miles east from the town, and situated in a narrow pass in the romantic valley of the Cserna. Of the twenty-two hot springs of Mehádía, nine are now in use, the most powerful one being the Hercules, which yields about 5,000 cubic feet of water per hour. The springs are all strongly impregnated with salts of sulphur, iodine, bromine, and chlorine, and their average temperature is 70° to 145° Fahr. They are much used for chronic rheumatism, gout, and cutaneous eruptions, and, during the season, which usually lasts from the middle of May to the end of September, are resorted to by over a thousand visitors.

MEHEMET ALI, or MOHAMMED 'ALÍ. See EGYPT.

MÉHUL, ÉTIENNE HENRI, one of the most remarkable composers of France, was born at Givet, in Ardennes, on June 24, 1763, and died in 1817.

MEIBOM, HEINRICH, was born at Lemgo on December 4, 1555, and died on September 20, 1625, at Helmstädt, where he had held the chair of history and poetry from 1583. He was a writer of Latin verses, and his talents in this direction were recognized by the emperor Rudolph II., who ennobled him and made him poet laureate in 1590.

MEININGEN, the capital of the little duchy of Saxe-Meiningen, in central Germany, and the seat of the provincial courts for Saxe-Meiningen, Saxe-Coburg, and the Prussian districts of Schmalkalden and Schleusingen, is situated on the right bank of the Werra,

about forty miles to the south of Eisenach. The population in 1901 was 14,518.

MEISSEN, an ancient and important industrial town of Saxony, is situated on the left bank of the Elbe, between the streams Meisse and Triebisch, in the district and about nine miles to the northwest of the town of Dresden. The population in 1901 was 31,437.

MEKONG, MEKHONG, or MAKONG, less frequently NAM-KONG, the Da-Kio of the Tibetans, the Lantsang-Kiang or Lankiang of the Chinese, and the Son-Kong of the Anamese, sometimes also called the Cambodia or Camboja, is one of the largest and most remarkable rivers in southern Asia. As it rises in Tibet, and reaches the China Sea after a somewhat devious course through Yunnan, Burmah, Siam, Cambodia, and Cochinchina, its total course may be safely stated at 2,000 miles. In spite, however, of this great length, the Mekong must be regarded as little more than a mountain torrent on an unusually large scale.

MELA, POMPONIUS, a Roman writer on geography. His little work, though a mere compendium, is the only systematic treatise on the subject preserved to us in the Latin language, with the exception of that which forms part of the encyclopædic work of the elder Pliny, and from this circumstance it derives a value to which it would be little entitled from its intrinsic merits. Nothing is known of the author except his name, and that he was born, as he himself informs us, at a small town called Tingentera in the south of Spain.

MELANCHTHON, PHILIP, son of an armorer named George Schwartzerd, was born at Bretten, a town of the lower Palatinate, on February 16, 1497. Taught first by John Hungarus, then by George Simler at the academy of Pfortzheim, where he lived in the house of Reuchlin's sister, young Schwartzerd exhibited remarkable precocity, and speedily won the regard of Reuchlin, who dubbed him Melanchthon (the Greek form of Schwartzerd), according to the fashion of that age. He lived two years at Heidelberg, and the next three at Reuchlin's university of Tübingen, where he studied law, medicine, and theology, taking his doctor's degree in 1514. In 1518, on Reuchlin's recommendation, Melanchthon was appointed by the elector of Saxony professor of Greek in the university of Wittenberg. This appointment marked an epoch in German university education; Wittenberg became the school of the nation. Luther himself received a fresh impulse toward the study of Greek, and his translation of the Scriptures, begun as early as 1517, now made rapid progress, Melanchthon helping to collate the Greek versions and revising Luther's translation.

Melanchthon was first drawn into the arena of the Reformation controversy through the Leipzig discussion, of which he was an eager spectator. He had been sharply reproved by Doctor Eck for giving aid to Carlstadt, and he was shortly afterward himself attacked by the blustering Ingolstadt doctor. Melanchthon replied in a brief treatise—a model of Christian moderation—setting forth Luther's first principle of the supreme authority of Scripture in opposition to the patristic writings on which Eck so boastfully relied. His marriage, in 1520, to Catherine Krapp of Wittenberg increased his own happiness, and gave a domestic center to the Reformation. In 1521, during Luther's confinement in the Wartburg, Melanchthon occupied the important position of leader of the Reformation cause at the university.

After the first diet of Spire (1526), where a precarious peace was patched up for the Reformed faith, Melanchthon was deputed as one of twenty-eight commissioners to visit the Reformed states and regulate the constitution of churches, he having just published

a famous treatise called the *Libellus Visitatorius*, a directory for the use of the commissioners. At the Marburg conference (1529) between the German and Swiss Reformers, Luther was pitted against Œcolampadius and Melancthon against Zwingli in the discussion regarding the real presence in the sacrament. At the diet of Augsburg (1530) Melancthon was the leading representative of the Reformation. With anxiety and tears he drew up for that diet the seventeen articles of the evangelical faith, which are known as the "Augsburg Confession." He held conferences with Romish divines appointed to adjust differences, and afterward wrote an *Apology for the Augsburg Confession*. After the Augsburg conference further attempts were made to settle the Reformation controversy by a compromise, and Melancthon, from his conciliatory spirit and facility of access, appeared to the Romanists the fittest of the Reformers to deal with.

In 1537, when the Protestant divines signed the Lutheran Articles of Smalkald, Melancthon appended to his signature the reservation that he would admit of a pope provided he allowed the gospel and did not claim to rule by divine right.

The year after Luther's death, when the battle of Mülberg (1547) had given a seemingly crushing blow to the Protestant cause, an attempt was made to weld together the iron and clay of the evangelical and the papal doctrines, which resulted in the compilation by Pflug, Sidonius, and Agricola of the Augsburg *Interim*. This was proposed to the two parties in Germany as a provisional ground of agreement till the decision of the council of Trent. Melancthon, on being referred to, declared equivocally that, though the *Interim* was inadmissible, yet so far as matters of indifference were concerned it might be received. Hence arose that "adiaphoristic" controversy in connection with which he has been misrepresented as holding among matters of indifference such cardinal doctrines as justification by faith, the number of the sacraments, as well as the dominion of the pope, feast-days, and so on. He afterward retracted his compliance with the adiaphora, and never really swerved from the views set forth in the *Loci Communes*; but he regarded the surrender of more perfect for less perfect forms of truth or of expression as a painful sacrifice rendered to the weakness of erring brethren. Luther, though he had uttered certain expressions of dissatisfaction with Melancthon, and had more keenly defended in his last years what was distinctively his own, yet maintained hearty and unbroken friendship with him; but after Luther's death certain smaller men arose in name of Luther who formed a party emphasizing the extremest points of the doctrine of the latter. Hence the later years of Melancthon were much occupied with acrid controversies within the evangelical church; an account of these, however, would be out of place here. His last years were spent in fruitless conferences with his Romanist adversaries, and amid various controversies among the Reformed, but the flame of his piety burnt brightly till the close. He died in his sixty-third year, on April 19, 1560, and his body was laid beside that of Martin Luther.

MELANESIA. This term comprises that long belt of island groups which, beginning in the Indian archipelago at the east limits of the region there occupied by the Malay race, and, as it were, a prolongation of the great island region, runs southeast for a distance of some 3,500 English miles, *i. e.*, from New Guinea at the equator to New Caledonia just within the Tropic, and eastward to Fiji. This chain of groups has a certain geographical as well as ethnical unity. Its curve follows roughly the outline of the Australian coast, and large islands occur, with a number of small ones, along the

whole length, with mountains of considerable height, coinciding pretty closely with a line of volcanic action. Melanesia is usually held to begin with New Guinea, this great island being then viewed as the headquarters of that dark Papuan race which, widely and variously modified in all the other groups, occupies the whole region, as the name Melanesia implies; but the race really extends further west, for the large islands Flores and Timor, with several smaller ones, are also essentially Papuan. The various Melanesian groups will be found described in detail under separate headings.

MELBOURNE, the capital of the colony of Victoria, and most populous city in Australia, is situated at the head of the large bay of Port Phillip, on its northern bend, known as Hobson's Bay, about 500 miles southwest of Sidney by land and 770 by sea. Along the shores of the bay the suburbs extend for a distance of over ten miles, but the part distinctively known as the "city" occupies a site about three miles inland, on the north bank of the Yarra river.

The appearance of Melbourne from the sea is by no means picturesque. The shipping suburbs of Sandridge and Williamstown occupy the alluvial land at the mouth of the Yarra, and, as the district is low and flat, and covered with factories, the prospect is not inviting. But the city itself has a very different aspect; its situation is relieved by numerous gentle hills, which show off to great advantage its fine public buildings; its streets are wide and well kept; and the universal appearance of prosperity, activity, and comfort under its usually clear blue sky impress the visitor favorably.

That part specially known as the "city" had a population, in 1881, of 65,800. It occupies the two hills of East Melbourne and West Melbourne; the valley that separates them, once occupied by a densely wooded little stream, is now partly filled in, and forms the busy thoroughfare of Elizabeth street; parallel to this runs Swanston street, and at right angles to these, and parallel to the river, are Bourke street, Collins street, and Flinders street—the first being the busiest in Melbourne, the second containing the most fashionable shops, and the third, which faces the river, being given over to maritime pursuits. These streets are an eighth of a mile apart; between them are narrower streets occupied by warehouses and business premises.

Around the "city" lies a circle of populous suburbs. Northeast is Fitzroy with 23,000 inhabitants; farther east, Collingwood, 24,000; east of Melbourne, Richmond, 23,400; southeast, Prahran, 21,000; south, Emerald Hill, 25,300; southwest, Sandridge, 8,700; northwest, Hotham, 17,800. These all lie within three miles of the general postoffice in Elizabeth street; but outside of them, and within a radius of five miles, there is a circle of less populous suburbs: to the north, Brunswick, 6,200; east, Kew, 4,200, and Hawthorn, 6,000; southeast, St. Kilda, 11,600, and Brighton, 4,700; southwest, Williamstown, 9,000, and Footscray, 6,000; northwest, Essenden and Flemington, 5,000. Numerous smaller suburbs fill up the spaces between these, the principal being Northcote, Preston, Camberwell, Toorak, Caulfield, Elsternwick, and Coburg, with a united population of 19,000.

In 1901 the population of Melbourne, including that of its suburbs, was estimated at 493,956. Fifteen of the suburbs rank as independent municipalities.

The public buildings are generally situated on positions from which they are seen to advantage. The Parliament Houses form a great pile of brickwork with four fronts in freestone. The interior decorations are highly elaborate. The Treasury is a well-proportioned building in freestone; behind it stands a vast building known as the Government offices. On the hill of West

Melbourne there is a large structure, for the law courts; it has four very handsome fronts, each about 300 feet in length, and the whole is surmounted by a lofty cupola, in the manner of the Capitol at Washington.

The Melbourne University is a picturesque, but by no means imposing, mass of buildings, buried among the trees of extensive and well-kept grounds about a mile from the heart of the city. In front of it stands the "Wilson Hall," erected at a cost of \$200,000. Behind is the National Museum, containing specimens of natural history. The museum, like all public places in Melbourne, is freely open to the people. Melbourne contains many churches, but few of them will compare with the public buildings in appearance.

There are in Melbourne, among its numerous state schools, about thirty whose size and proportions entitle them to rank with the architectural ornaments of the city. They have each accommodation for from 600 to 2,000 scholars. Abundant provision has been made for secondary instruction by the denominations and by private enterprise.

Melbourne contains the offices of numerous banks, savings banks, and building societies.

The parks and public gardens of Melbourne are extensive and handsome.

The shipping of Melbourne is very considerable. In 1900 about 1,830 vessels entered and cleared again, their tonnage being 2,827,950 tons.

The climate of Melbourne is exceptionally fine, the only drawback being the occasional hot winds which blow from the north for two or three days at a time, and raise the temperature to an uncomfortable extent.

MELBOURNE, WILLIAM LAMB, SECOND VISCOUNT, English statesman, was born March 15, 1779, and died in 1848.

MELCHIADES, or MILTIADES (other forms of the name being Meltiades, Melciades, Milciades, and Miltides), was pope from July 2, 310, to January 10 or 11, 314. He appears to have been an African by birth, but of his personal history nothing is known.

MELCHITES. The name of Melchites means etymologically the royal party, and so is currently applied in the East to Syrian and Egyptian Christians of the Orthodox Greek Church, adherents of the creed supported by the authority of the king, that is, of the Byzantine emperor. The Melchites, therefore, are those who accept the decrees of Ephesus and Chalcedon as distinguished from the Nestorians and Jacobites, and the name reflects in an interesting manner the way in which the doctrinal controversies that agitated the Eastern empire associated themselves with national feelings of antagonism to the imperial rule.

MELCHIZEDEK ("king of righteousness"), king of Salem and priest of "supreme El," brought forth bread and wine to Abram, on his return from the expedition against Chedorlaomer, and blessed him in the name of the supreme God, possessor (or maker) of heaven and earth. And Abram gave him tithes of all his booty. The Bible history tells us nothing more about Melchizedek; but the majestic figure of the king-priest, prior to the priesthood of the law, to whom even the father of all Israel paid tithes, suggested a figurative or typical application; first in Psalm cx. to the viceroy of Jehovah, seated on the throne of Zion, the king of Israel who is also priest after the order of Melchizedek, and then, after the gospel had confirmed the Messianic interpretation of the Psalm, to the kingly priesthood of Jesus, as that idea is worked out at length in the Epistle to the Hebrews.

MELCOMBE REGIS. See WEYMOUTH.

MELLENDEZ VALDES, JUAN, minor poet of

Spain, was born at Ribera del Fresno, Badajoz, on March 11, 1754, and died in 1817.

MELFI, a city of Italy, in the province of Potenza, thirty miles north of Potenza, on the road and railway between that city and Foggia, is built on a small hill on the lower slopes of Monte Volture. Population (1900), about 14,000.

MELITA, the classical name for MALTA (*q.v.*), was also the name borne by the modern *Meloda*, one of the Dalmatian islands, situated immediately to the south of Sabbioncello and to the north of Ragusa. It is about twenty-four miles in length, averaging about one and one-half in breadth, and has a good harbor.

MELITO, bishop of Sardes, a Christian writer of the second century, is mentioned by Eusebius along with Hegesippus, Dionysius of Corinth, Apollinaris of Hierapolis, Irenæus, and others, his contemporaries, as a champion of orthodoxy and upholder of apostolic tradition. Of his personal history nothing is known, and of his numerous works (which are enumerated by Eusebius) only a few fragments are now extant.

MELLONI, MACEDONIO, a distinguished physicist, was born at Parma on April 11, 1798. From 1824 to 1831 he was professor at Parma, but in the latter year he was compelled to escape to France, having taken part in the Revolution. In 1839 he went to Naples as director of the conservatory of arts and handicrafts. He was likewise director of the Vesuvius observatory, a post which he held until 1848. Melloni received the Rumford medal of the Royal Society in 1834. In 1835 he was elected correspondent of the Paris Academy, and in 1839 a foreign member of the Royal Society. He died from an attack of cholera on August 11, 1854.

MELON (*Cucumis Melo*, L.), a most polymorphic species of the order *Cucurbitaceæ*, the varieties of which are grouped by Naudin under ten tribes, while several other plants of less known characteristics probably belong to it. The melon is an annual herb with palmately-lobed leaves, and bears tendrils. It is monoecious, having male and female flowers on the same plant. The flowers have deeply five-lobed campanulate corollas and three stamens. Naudin observed that in some varieties (*e.g.*, of cantaloupes) fertile stamens sometimes occur in the female flowers. It is a native of south Asia, "from the foot of the Himalayas to Cape Comorin," where it grows spontaneously, but is cultivated in the temperate and warm regions of the whole world. It is excessively variable both in its diversity of foliage and habit, but much more so in the fruit, which in some varieties is no larger than an olive, while in others it rivals the ponderous fruits of the gourds, (*Cucurbita maxima*, L.) The fruit may be globular, ovoid, spindle-shaped, or serpent-like, netted or smooth skinned, ribbed or furrowed, variously colored externally, with white, green, or orange flesh when ripe, scented or scentless, sweet or insipid, bitter or even nauseous, etc. Like the gourd, the melon undergoes strange metamorphoses by crossing its varieties, though the latter preserve their characters when alone. The offspring, however, of all crossings are fertile.

MELOS, the modern Milo, one of the Sporades of the Ægean Sea, situated at the southwest corner of the archipelago, seventy-five miles due east from the coast of Laconia. From east to west it measures about fourteen miles, from north to south eight miles, and its area is estimated at fifty-two square miles.

MELROSE, a village of Roxburghshire, Scotland, on the south bank of the Tweed, thirty-seven miles by rail south-southeast of Edinburgh.

It was in the abbey-church of Melrose, where Alexander II. had long before been buried near the high altar, that the heart of Bruce found its final resting-

place; and among the many tombs which afterward gathered under the same roof were those of his faithful knight James Lord Douglas, Sir William the dark knight of Liddesdale, and the hero of Chevy Chase.

MELROSE, a suburb of Boston, in Middlesex county, Mass., seven miles to the north. It has a high school, newspapers, banks, churches, and some manufactures. Population (1900), 12,962.

MELTON MOWBRAY, a market-town of England, county of Leicester, is pleasantly situated in a fertile vale, at the confluence of the Wreake and Eye, fifteen miles northeast of Leicester and 104 north of London by rail.

MELUN, capital of the department of Seine-et-Marne, France, twenty-eight miles southeast of Paris by railway, occupies a hill on the right bank of the Seine and the level ground at its foot. Melun is near one of the most beautiful parts of the forest of Fontainebleau. The population in 1901 was about 14,000.

MELVILLE, HENRY DUNDAS, VISCOUNT, British statesman, was born at Edinburgh, in 1741, and died in 1811.

MELVILLE, ANDREW, a distinguished Scottish scholar, theologian, and religious reformer, was the youngest son of Richard Melville, proprietor of Baldoon, near Montrose, at which place Andrew was born in 1545 and died in 1622.

MELVILLE, GEORGE JOHN WHYTE, born in 1821, has a right to be regarded as the founder of a school of fashionable novels—the fashionable sporting novel. The eldest son of Major Whyte Melville, of Mount Melville, Fifeshire, he received his school education, like so many of his heroes, at Eton, entered the army in 1839, became captain in the Coldstream Guards in 1846, and retired in 1849. His first appearance in literature was made soon after, with a translation of Horace into fluent and graceful verse, published in 1850. His first novel was *Digby Grand*, published in 1853. When the Crimean War broke out, Whyte Melville took part in it as a volunteer in the Turkish contingent; but this was the only break in his literary career from the time that he began to write novels till his death, in 1878. By a strange accident, he lost his life in the hunting-field, the hero of many a stiff ride meeting his fate in galloping quietly over an ordinary plowed field. Twenty-one novels appeared from his pen after his return from the Crimea.

MELVILL VAN CARNBEE, PIETER, BARON, an eminent Dutch geographer, was born at the Hague May 20, 1816, and died October 24, 1856.

MEMEL, the most northerly town in Germany, and the principal seat of the Baltic timber trade, is situated in the district of Königsberg, Prussia, at the mouth of the Dange, and on the bank of a sound connecting the Kurische Haff with the Baltic Sea. The population of Memel in 1900 was about 24,000.

MEMLING, HANS, a painter of the fifteenth century, whose art gave a passing luster to Bruges in the period of its political and commercial decline. The date of his birth is unknown; but his death is said to have occurred in 1477.

MEMMI. See MARTINI, SIMONE.

MEMMINGEN, a town of Bavaria, in the district of Schwaben and Neuburg, is situated about thirty-five miles to the southwest of Augsburg, near the river Iller.

MEMNON. In the Homeric mythology (or rather the mythology of the *Troica* in the much fuller form in which it existed in the times of Pindar and the tragic poets) this hero was called the son of Tithonus (the half-brother of Priam) and Eos (Aurora). Tradition represented him as an Ethiopian prince who came to assist the Trojans against the Greeks, and performed

prodigies of valor, but was at length killed by Achilles, after having himself slain Antilochus, the son of Nestor, an event alluded to by Pindar. His story must have been very famous, for more than one Greek play was composed bearing the title.

MEMPHIS, the capital of the old Egyptian empire, founded by Menes, the first historical king (see EGYPT). In the time of Strabo it was the second city of Egypt, inferior only to Alexandria, and with a mixed population like the latter. Memphis was still an important though declining place at the time of the Moslem conquest. Its final fall was due to the rise of the Arabic city of Fostat on the right bank of the Nile almost opposite the northern end of the old capital; and its ruins, so far as they still lay above ground, gradually disappeared, being used as a quarry for the new city. The remains of "Menf" were still imposing late in the twelfth century, when they were described by 'Abd el-Latif. In the Old Testament Memphis is mentioned under the names of Moph and Noph.

MEMPHIS, a city of the United States, and port of entry, capital of Shelby county, Tenn., is situated on the east bank of the Mississippi river, just below the mouth of Wolf river, 450 miles below St. Louis and 826 miles above New Orleans. The bluff on which the city stands has an average elevation of forty-seven and one-half feet above high-water mark, with a further fall of thirty-six feet to extreme low water. Memphis is methodically and tastefully planned, and is adorned with many elegant private residences and public buildings, conspicuous among the latter being the United States custom-house, located upon the esplanade between Front street and the river, and built of the best quality of marble, the product of Tennessee quarries. A small park in the center of the city contains a bust of Andrew Jackson. The streets are mostly well paved, and are supplied with water from the Wolf river by the Holly system. The bayou Gayoso, with several branches, intersects the city, and prior to 1880 received most of its drainage. Since that date over forty miles of sewers and more than that length of subsoil drain-tiles have been constructed on the Waring system, providing the city with a superior system of drainage.

Memphis is a growing and busy place, and the most important commercial city on the Mississippi between St. Louis and New Orleans. The largest sea-going vessels ascend the river to this point, and navigation is open at all seasons of the year. The city also possesses abundant facilities for transportation by railway in every direction. Memphis ranks as the largest interior cotton market in the United States, the receipts for the season averaging 500,000 bales. The aggregate receipts from the mercantile and manufacturing interests for the year average \$70,000,000, of which the trade in groceries and western products contributes nearly \$45,000,000; dry goods, clothing, boots and shoes, and general merchandise, \$15,000,000; and various home manufactures about \$10,000,000. There are oil-mills and refineries whose annual product of about 30,000 barrels of cotton-seed oil, together with oil-cake and re-ginned cotton, amounts to over \$1,000,000. There are also numerous foundries, machine-shops, flouring-mills, and manufactories of carriages, furniture, and tobacco.

The city contains, besides the usual religious, educational, and commercial institutions, a public library of 9,000 volumes, several daily and weekly newspapers, a chamber of commerce, and a cotton exchange.

Memphis was laid out as a village in 1820, and incorporated as a city in 1831. Its population, according to a census taken on October 1, 1882, within the city limits, was 47,976 (29,130 white and 18,846 colored); in 1900, the population was 102,320.

During the civil war Memphis was early occupied by the Union forces (June 6, 1862), after a naval engagement in which Commodore Davis with a fleet of nine gunboats and rams defeated a similar Confederate fleet of eight vessels, and captured or destroyed all of them but one. The city was held by Federal troops to the close of the war, with the exception of a brief occupation, in August, 1864, by General Forrest who captured several hundred prisoners, but immediately withdrew. The decrease of population between 1870 and 1880 was due to the ravages of yellow fever in 1873, 1878, and 1879. The epidemic of 1873 resulted in over 2,000 deaths. In 1878, according to the report of the Howard Relief Association, the number of those attacked with fever was 15,000, and the number of deaths reached the total of 5,150, of whom 4,250 were whites and 900 colored. At the return of the fever in 1879 better care and strict quarantine arrangements prevailed, but there were 1,595 cases, with 497 deaths. During the epidemics of 1878 and 1879 fully two-thirds of the population fled from the city, many of whom died of the fever at other places, and a still larger number did not return. For three months during each year business was wholly suspended, and all ingress or egress except for the most necessary purposes was forbidden. The prostration of the business of the place left the city almost hopelessly bankrupt, and as a means of relief the legislature of the state, in January, 1879, repealed the city's charter, and, assuming exclusive control of its taxation and finances, constituted it simply a "taxing district," placing its government in the hands of a "legislative council." This anomalous proceeding has been declared constitutional by the Supreme Court of Tennessee. Since that time the city has regained its prosperity, and is now one of the healthiest and most prosperous cities on the river.

MENA, JUAN DE, one of the Italianizing Spanish poets of the fifteenth century, was born at Cordova about 1411. He died suddenly, in consequence of a fall from his mule, in 1456, at Torre Laguna.

MÉNAGE, GILLES, described by Bayle as "one of the most learned men of his time, and the Varro of the seventeenth century," was the son of Guillaume Ménage, king's advocate at Angers, and was born in that city on August 15, 1613. He died at Paris July 23, 1692.

MENANDER, the most famous Greek poet of the New Comedy, which prevailed from about the death of Alexander the Great (323 B.C.) to 250. He was born at Athens in 342, and died, it was said, by drowning in the harbor of that city (Piræus) in 291.

MENCIUS, the Latinized form of Mǎng-tszé, "Mr. Mǎng," or "Mǎng the philosopher," a name in China only second as a moral teacher to that of Confucius. His statue or spirit-tablet (as the case may be) has occupied, in the temples of the sage, since our eleventh century, a place among "the four assessors;" and since 1530 A.D. his title has been "the philosopher Mǎng, sage of the second degree."

The dates of some of the principal events in Mencius' life are fixed by a combination of evidence, and his death is referred by common consent to the year 289 B.C. He had lived to a great age—some say to his eighty-fourth year, placing his birth in 372 B.C., and others to his ninety-seventh, placing it in 385.

We have no accounts of Mencius for many years after his boyhood, and he is more than forty years old when he comes before us as a public character. He must have spent much time in study, investigating the questions which were rife as to fundamental principles of morals and society, and brooding over the condition of the country. The history, the poetry, the institutions, and

the great men of the past had received his careful attention. He intimates that he had been in communication with men who had been disciples of Confucius. That sage had become to him the chief of mortal men, the object of his untiring admiration; and in the doctrines which he had taught Mencius recognized the truth for want of an appreciation of which the bonds of order all around him were being relaxed, and the kingdom hastening to a general anarchy.

Most vivid are the pictures which Mencius gives of the condition of the people in consequence of the wars of the states. "The royal ordinances were violated; the multitudes were oppressed; the supplies of food and drink flowed away like water." It is not wonderful that, when the foundations of government were thus overthrown, speculations should have arisen that threatened to overthrow what he considered to be the foundations of truth and all social order.

On this seething ocean of lawlessness, wickedness, heresies, and misery, Mencius looked out from the quiet of his school, and his spirit was stirred within him to attempt the rescue of the people from the misrule and error. It might be that he would prove the instrument for this purpose. He formed his plan, and proceeded to put it into execution. He would go about among the different kings till he should find one among them who would follow his counsels and commit to him the entire administration of his government. That obtained, he did not doubt that in a few years there would be a kingdom so strong and so good that all rulers would acknowledge its superiority, and the people hasten from all quarters to crown its sovereign as monarch of the whole of China. This plan was much the same as that of Confucius had been; but, with the bolder character that belonged to him, Mencius took in one respect a position from which "the master" would have shrunk. The former was always loyal to Cháu, and thought he could save the country by a reformation; the latter saw the day of Cháu was past, and the time was come for a revolution. Mencius' view was the more correct, but he was not wiser than the sage in forecasting for the future. They could think only of a reformed dynasty or of a changed dynasty, ruling according to the model principles of a feudal constitution, which they described in glowing language. They desired a repetition of the golden age in the remote past; but soon after Mencius disappeared from the stage of life there came the sovereign of Ch'in, and solved the question with fire and sword, introducing the despotic empire which has since prevailed.

MENDELSSOHN, FELIX. Jakob Ludwig Felix Mendelssohn-Bartholdy, one of the greatest composers of this century, was the grandson of Moses Mendelssohn noticed below, and was born in Hamburg on February 3, 1809.

Felix first played in public on October 24, 1818, taking the pianoforte part in a trio by Woelfl. On April 11, 1819, he entered the Berlin Singakademie as an alto, and in the following year began to compose with extraordinary rapidity. His earliest dated work is a cantata, completed on January 13, 1820. During that year alone he produced nearly sixty movements, including songs, pianoforte sonatas, a trio for pianoforte, violin, and violoncello, a sonata for violin and pianoforte, pieces for the organ, and even a little dramatic piece in three scenes. In 1821 he wrote five symphonies for stringed instruments, each in three movements; motets, for four voices; an opera, in one act, called *Soldatenliebschaft*; another, called *Die beiden Pädagogen*; part of a third, called *Die wandernde Comödianten*; and an immense quantity of other music of different kinds, some of which,

thought worthy of publication by the editors of his posthumous works, now stands before the world in evidence of the precocity of his genius.

In 1825 Abraham Mendelssohn took Felix to Paris, where, among other musicians then resident in the French capital, he met the two most popular dramatic composers of the age, Rossini and Meyerbeer, and lived on terms of intimacy with Hummel, Kalkbrenner, Rode, Baillot, Herz, and many other artists of European celebrity. He returned to Berlin with his father in May, 1825.

Soon after his return from Paris, Abraham Mendelssohn removed from his mother's residence to No. 3 Leipziger Strasse. The finished score of the overture to *Midsummer Night's Dream* is dated "Berlin, August 6, 1826"—that is to say, three days after its author had attained the age of seventeen years and a half. The overture was first publicly performed at Stettin, in February, 1827.

Meanwhile *Camacho's Wedding* had been submitted to Herr General-Musik-Director Spontini, with a view to its production at the opera. The work was put into rehearsal soon after the composer's return from Stettin, produced on April 29, 1827, and received with apparent enthusiasm; it never reached a second performance.

In April, 1829, Mendelssohn paid his first visit to London. His reception was most enthusiastic.

The visit to England formed in reality the first division only of a great scheme of travel which his father wished him to extend to all the most important art centers in Europe. After refusing the offer of a professorship at Berlin, he started again, in May, 1830, for Italy, passing on his way at Weimar, where he spent a memorable fortnight with Goethe, and reaching Rome, after many pleasant interruptions, on November 1st.

In passing through Munich on his return in October, 1831, he composed and played his pianoforte concerto in G minor, and accepted a commission (never fulfilled) to compose an opera for the Munich theater.

On April 23, 1832, he was again in London, where he twice played his G minor concerto at the Philharmonic concerts, gave a performance on the organ at St. Paul's, and published his first book of *Lieder ohne Worte*. He returned to Berlin in July, and during the winter he gave public performances of his Reformation symphony, his concerto in G minor, and his *Walpurgisnacht*. In the following spring he paid a third visit to London for the purpose of conducting his Italian symphony, which was played for the first time, by the Philharmonic Society, on May 13, 1833. On the 26th of the same month he conducted the performances at the Lower Rhine festival at Düsseldorf, with such brilliant effect that he was at once invited to accept the appointment of general-music-director to the town, an office which included the management of the music in the principal churches, at the theater, and at the rooms of two musical associations. This post he willingly accepted, and it formed a stepping-stone to a far more important one.

Before entering upon his new duties, Mendelssohn paid a fourth visit to London, with his father, returning to Düsseldorf on September 27, 1833. There he first designed his famous oratorio *St. Paul*, in response to an application from the Cäcilien-Verein at Frankfurt, composed his overture to *Die schöne Melusine*, and planned some other works of importance.

The next great event in Mendelssohn's life was his happy marriage, on March 28, 1837, to Cecile Charlotte Sophie Jeanrenaud, whose amiable disposition, surpassing beauty, and indescribable charm of manner endeared her to all who knew her. The honeymoon was scarcely over before he was again summoned to

England to conduct *St. Paul*, at the Birmingham festival, on September 20th. During this visit he played on the organ at St. Paul's and at Christ Church, Newgate Street, with an effect which exercised a lasting influence upon English organists. It was here also that he first contemplated the production of his second oratorio, *Elijah*.

Passing over the composition of the *Lobgesang* in 1840, a sixth visit to England in the same year, the scheme for the erection of a monument to Sebastian Bach, and other events on which space does not permit us to enlarge, we find Mendelssohn, in 1841, recalled to Berlin by the king of Prussia, with the title of Kapellmeister. Though this appointment resulted in the production of *Antigone*, *Edipus Coloneus*, *Athalie*, the incidental music to the *Midsummer Night's Dream*, and other great works, it proved an endless source of vexation, and certainly helped to shorten the composer's life. In 1842 he went to England for the seventh time. He returned to his duties at Berlin in September, but happily succeeded in persuading the king to free him from his most onerous engagements, and his delight at this relief was unbounded.

After a brief residence in Frankfort, Mendelssohn returned to Leipzig in September, 1845, resuming his old duties at the Gewandhaus, and teaching regularly in the conservatoire. Here he remained, with little interruption, during the winter—introducing his friend Jenny Lind, then at the height of her popularity, to the critical frequenters of the Gewandhaus, and steadily working at *Elijah*, the first performance of which he conducted at the Birmingham festival, on August 26, 1846. In 1847 he visited England for the tenth and last time. He witnessed Jenny Lind's first appearance at Her Majesty's Theater, on May 4th, and left England on the 9th, little anticipating the trial that awaited him in the tidings of the sudden death of his sister Fanny, which reached him only a few days after his arrival in Frankfort. He fell to the ground insensible, and never fully recovered. He lingered on, now better now worse, through weary weeks, and on November 4th he passed away.

MENDELSSOHN, MOSES, philosopher and scholar, well known as Lessing's friend and the prototype of his "Nathan," was born on September 6, 1729, at Dessau on the Elbe. His numerous writings include *Ueber Evidenz in metaphysischen Wissenschaften* (1763); *Briefe über die Empfindungen* (1764); *Phædon, oder über die Unsterblichkeit der Seele* (1767); *Jerusalem, oder die religiöse Macht und Judenthum* (1783); one or two tracts in Hebrew; and some new German translations from the Old Testament. The controversy which led to the publication of his *Morgenstunden* (1785-86), a reply to Jacobi's *Briefe über die Lehre Spinoza's*, is said to have been more or less directly the cause of his death, which took place on January 4, 1786 (see JACOBI). Of Mendelssohn's three sons, the second, Abraham, settled as a banker in Hamburg and married a Jewess, Lea Salomon Bartholdy, who bore him four children; these, by advice of their mother's brother, himself a conscientious convert from Judaism, were educated as Christians, and thenceforth joined their mother's second surname to their own. The second of them, Felix, is the subject of the preceding notice.

MENDOZA, a city of the Argentine Republic, the only town of the province of Mendoza, lies 700 miles west-northwest of Buenos Ayres, at the foot of the Cordilleras. It was formerly a frequent stopping-place on the route across the Andes by the Uspallata Pass, and used to rank as one of the best-built towns in the country, but in 1861 it was almost completely destroyed by an appalling earthquake, in which the people, for the

most part collected in the churches, perished to the number of about 12,000. Bravard, a French geologist who had often predicted the catastrophe, was one of those who perished.

MENDOZA, DIEGO HURTADO DE, novelist, poet, diplomatist, and historian, was a younger son of the member of the illustrious Mendoza family to whom the government of Granada was intrusted not long after its surrender, and was born in that city about the year 1503. He died at Madrid (which he had obtained leave to visit on some business errand) in April, 1575.

MENDOZA, INIGO LOPEZ DE. See SANTILLANA.

MENELAUS, king of Sparta, was the brother of AGAMEMNON (*q.v.*) and the husband of HELENA, (*q.v.*) He was one of the heroes of the Trojan horse, and recovered his wife at the sack of the city. On the voyage homeward his fleet was scattered off Malea by a storm which drove him to Crete; after seven years' further wandering to Cyprus, Phœnicia, Egypt, Ethiopia, Libya, and the country of the Erembi, he at last had an interview with Proteus and obtained a favorable wind which brought him home on the very day on which Orestes was holding the funeral feast over Ægisthus and Clytæmnestra. After a long and happy life in Lacedæmon, Menelaus, as the son-in-law of Zeus, did not die, but was translated to Elysium.

MENGES, ANTONY RAPHAEL, was the most celebrated representative of the eclectic school of painting in the eighteenth century, and played a great part in the early days of the classic revival. He was born in 1728 at Aussig, in Bohemia. In 1779 he died at Rome.

MENHADEN, economically one of the most important fishes in the United States, known by a great number of local names, "menhaden" and "mossbunker" being those most generally in use. In systematic works it appears under the names of *Clupea menhaden* and *Brevoortia tyrannus*. It is allied to the European species of shad and pilchard, and, like the latter, approaches the coast in its wanderings in immense shoals, which are found throughout the year in some part of the littoral waters between Maine and Florida, the northern shoals retiring into deeper water or to more southern latitudes with the approach of cold weather. The average size of the menhaden is about twelve inches.

MENIN, a small Belgian town, in the province of West Flanders; it is traversed by the river Lys, which there forms the boundary between France and Belgium. The population in 1900 was about 12,500.

MENINGITIS, a term in medicine applied to inflammation affecting membranes of the brain (cerebral meningitis) or spinal cord (spinal meningitis) or both.

Of *cerebral meningitis* there are two varieties—(1) that due to the presence of tubercle in the membranes of the brain, which gives rise to the disease known as tubercular meningitis, or acute hydrocephalus; and (2) simple or acute meningitis, which may arise from various causes. Among the more common are injuries of the head, extension of disease from contiguous parts, such as erysipelas of the scalp or caries of the bones of the ear, exposure to cold or to extreme heat, the presence of tumors in the substance of the brain. It may likewise occur in the course of fevers, rheumatism, and inflammatory affections, and also as a result of mental overwork, sleeplessness, and alcoholic excess. This latter variety of meningitis is less common than the former, but it is on the whole more amenable to treatment. The symptoms present such a general resemblance to those already described in tubercular meningitis that it is unnecessary to refer to them in detail (see HYDROCEPHALUS), and the treatment is essentially the same for both.

Spinal meningitis, or inflammation of the membranes

investing the spinal cord, generally results from causes of a similar kind to those producing cerebral meningitis—injuries, exposure to cold or sudden changes of temperature, diseases affecting adjacent parts such as the vertebral column or the spinal cord itself, or extension downward of the inflammation of the membranes of the brain. It is said to be most common in males. As in the case of the brain, the membranes become extremely congested; exudation of lymph and effusion of serum follow; and the spinal cord and roots of the nerves become more or less involved in the morbid process.

The chief symptoms are fever, with severe pain in the back or loins shooting downward into the limbs (which are the seat of frequent painful involuntary startings), accompanied with a feeling of tightness around the body. The local symptoms bear reference to the portion of the cord the membranes of which are involved. Thus when the inflammation is located in the cervical portion the muscles of the arms and chest are spasmodically contracted, and there may be difficulty of swallowing or breathing, or embarrassed heart's action, while when the disease is seated in the lower portion, the lower limbs and the bladder and rectum are the parts affected in this way. At first there is excited sensibility (hyperæsthesia) in the parts of the surface of the body in relation with the portion of cord affected. As the disease advances these symptoms give place to those of partial loss of power in the affected muscles, and also partial anæsthesia. These various phenomena may entirely pass away, and the patient after some weeks or months recover; or, on the other hand, they may increase, and end in permanent paralysis.

The treatment is directed to allaying the pain and inflammatory action by opiates. Ergot of rye is strongly recommended by many physicians. The patient should have perfect rest in the recumbent, or better still in the prone, position. Cold applications to the spine may be of use, while scrupulous attention to the functions of the bladder and bowels, and to the condition of the skin with the view of preventing bed-sores, is all-important.

Epidemic Cerebro-spinal Meningitis.—This name, as well as *cerebro-spinal fever*, is applied to a disease defined in the *Nomenclature of Diseases* as "a malignant epidemic fever, attended by painful contractions of the muscles of the neck and retraction of the head. In certain epidemics it is frequently accompanied by a profuse purpuric eruption, and occasionally by secondary effusions into certain joints. Lesions of the brain and spinal cord are found on dissection." This disease appears to have been first distinctly recognized in the year 1837, when it prevailed as an epidemic in the southwest of France, chiefly among troops in garrison. For several years subsequently it existed in various other localities in France, and mostly among soldiers. At the same time in other countries in western and central Europe the disease was observed in epidemic outbreaks, among both civil and military populations. In 1846 it first showed itself in Ireland, chiefly among the inmates of workhouses in Belfast and Dublin. Numerous outbreaks occurred also about the same period in many parts of the United States. In more recent times the disease has repeatedly appeared in both Europe and America, but it has seldom prevailed extensively in any one tract of country, the outbreaks affecting for the most part limited communities, such as garrisons or camps, schools, workhouses, and prisons.

Little is known regarding the causation of this disease. All ages seem liable to suffer, and, as regards sex, males are affected more commonly than females. Occupation and condition of life appear to exercise no influence. It has been observed to occur most fre-

quently in cold seasons. The question of the contagiousness of cerebro-spinal fever remains still unsettled, but the weight of authority appears to be in favor of the theory of the communicability of the disease. It cannot, however, be regarded as contagious in the same degree as some other specific fevers, such as typhus fever, smallpox, or scarlatina.

The following are the more prominent symptoms:—After a few days of general discomfort the attack comes on sharply with rigors, intense headache, giddiness, and vomiting. Neuralgic pains in the abdomen, and pain with spasmodic contractions in the muscles of the extremities, occur at an early stage. The headache continues with great severity, and restlessness and delirium supervene, accompanied with periods of somnolence. The pains and spasms rapidly increase, the muscles of the neck, spine, and limbs being specially affected. The patient's head is drawn backward and rigidly fixed, the spine arched, and the arms and legs powerfully flexed, the whole condition bearing a considerable resemblance to tetanus. For a time there is greatly increased sensibility of the skin, pain being excited by the slightest contact. There is more or less fever present. About the fourth day of the disease an eruption on the skin both of the face and of the body frequently appears, in the form either of purpuric spots or small, clear vesicles. Death may take place in from a few hours to eight or ten days. Should the patient survive the immediate shock of the attack, serious complications are apt to appear in the form of destructive inflammation of the eyes or ears, inflammation with effusion into certain joints, and paralysis of limbs; or, again, recovery may take place after a prolonged convalescence. The mortality appears to vary in different epidemics, in some being as high as 80 per cent., in others only about 20 per cent. Certain forms of the disease are of malignant character from the first, and very rapidly fatal.

The changes found after death in cerebro-spinal fever are intense inflammation of the membrane of the brain and spinal cord, with effusion of serum or pus into the ventricular and arachnoid spaces.

The treatment is similar to that of other febrile conditions, but for the special symptoms of pain, spasm, etc., opium seems to have been found of eminent service, while quinine and ergot of rye are also recommended.

MENOMINEE, a Michigan town in the county of the same name, of which it is the capital, lies at the mouth of the Menominee River, in the midst of a productive mining and lumbering region. It has banks, telegraphs, railroads, schools, and churches. Its manufactures comprise lumber products, pig-metals, and brewery products. Population (1900), 12,818.

MENNONITES is a name borne by certain Christian communities in Europe and America, denoting their adherence to a type of doctrine of which Menno Simons was, not indeed the originator, but the chief exponent at the time when the anti-pædo-baptism of the congregations in which he labored took permanent form in opposition to ordinary Protestantism on the one hand and to the theocratic ideas of the Münster type of anabaptism on the other. The original home of the views afterward called Mennonite was in Zürich, where, as early as 1525, Grebel and Manz founded a community having for its most distinctive mark baptism upon confession of faith. The chief doctrines of these Zürich Baptists have been already stated in the article **BAPTISTS**. The main interest of the sect lay not in dogma, but in discipline. Within the communities evangelical life was reduced to a law of separation from the world, and this separation—enforced by a stringent use of excommunication and the prohibition of marriage

beyond the brotherhood—involved not only abstinence from worldly vanities, but refusal of civic duties (the state being held to be un-Christian)—refusal to take an oath or use the sword.

Each community was quite independent, united to the rest only by a bond of love. There was no sort of hierarchy, but only "exhorters" chosen by the congregation, of whom the most prominent were also "elders" intrusted with the administration of the sacraments—an organization so easily kept alive or reproduced that the movement could hardly be checked by any persecution short of the total annihilation which at length was actually the fate of many of the Swiss communities. The remnants of the Swiss Mennonites broke, in 1620, into two parties, the stricter of which, the Ammanites or Upland Mennonites, were distinguished from the Lowland Mennonites by holding that excommunication of one party dissolved marriage, and by their rejection of buttons and the use of the razor. Their persecution lasted till 1710; a few congregations still remain and keep themselves quite distinct from Baptist bodies of more modern origin. In Germany the Mennonites are somewhat more numerous; more important are the German Mennonite colonies in southern Russia, brought thither in 1783 by the empress Catherine, which in turn have recently sent many emigrants to America. America indeed, and especially Pennsylvania, early became a refuge for the Mennonites of Switzerland, the Palatinate, and Holland, and is now the chief home of the body (60,000 in the United States and 25,000 in Canada). The oldest congregation is that of Germantown (since 1683); the most numerous of several divisions are the Old Mennonites, corresponding to the less strict of the Swiss sections.

MENSHIKOFF, ALEXANDER DANILOVICH, born at Moscow on November 17 (O.S.), 1672, was the son of a poor man, who employed him to sell cakes about the streets of that city. In this humble occupation he attracted the attention of Lefort, one of Peter the Great's most active coöperators, who was pleased with his sprightliness, and took him into his service. Peter, soon afterward seeing the youth at Lefort's, was also delighted with him, and took him to be his page. Menshikoff soon became indispensable to the czar, assisting him in his workshop, and displaying signal bravery in the company of his master at the siege of Azoff. He formed one of the suite of Peter during his travels, and worked with him at Saardam and Deptford. Throughout his wars with the Swedes, Menshikoff was the companion of the czar, and greatly distinguished himself. For his gallantry at the battle of the Neva, on May 7 (O.S.), 1703, he received the order of St. Andrew. In 1704 he was made general, and at the request of the czar created a prince of the Holy Roman Empire. On the death of Peter the position of Menshikoff became very perilous; his successes had raised about him a host of enemies eager for his downfall. A chain of events was gradually leading to the downfall of the favorite. His family was banished to Siberia, and arrived at Berezzoff toward the end of 1727. Menshikoff's wife died on the journey, and was buried near Kazan. On the arrival of the prisoners they were lodged in a wooden house, consisting of four rooms. But Menshikoff did not long endure the horrors of exile in this inclement region. According to Mannstein, he died (November 12, O.S., 1729) of an apoplectic stroke, because there was no one at Berezzoff, as he himself remarked, who understood how to open a vein. The young czar ordered the release from exile of the two remaining children of Menshikoff—his daughter Mary had died at Berezzoff in the same year as his father—and restored some of their property to them.

MENSHIKOFF, ALEXANDER SERGIEVICH, great-grandson of Peter's favorite, born in 1787, entered the Russian service as attaché to the embassy at Vienna. He accompanied the emperor Alexander throughout his campaigns against Napoleon, and attained the rank of general, but retired from active service in 1823. On the outbreak of the Crimean War, he was appointed commander-in-chief, and suffered a severe defeat at the Alma. On the death of the emperor Nicholas in 1855 he was recalled, ostensibly on account of failing health. He died in 1869.

MENSTRUATION, a function of the female of the human species, occurring at intervals of twenty-four to twenty-eight days, and continuing for three to seven days in the healthy subject. The recurrence of the period is marked by a swelling and soreness of the mammae and a flow of blood from the generative organs. The exact office of the flow has never been satisfactorily determined—one physiologist holding one opinion and another a different view. That it is intimately connected with the reproductive function is certain from the fact that conception is dependent on this exhibition, the regularity of which is of paramount importance as regards the health of a woman. The first appearance of the flow is generally at a period of life between twelve and sixteen years (though in many cases this period varies either way), and it ceases usually between the forty-fifth and fiftieth years of life. Many disorders of the function are observable, in regard to all of which the best advice to be given is at once to place the subject under competent medical care, as more of the usefulness and happiness of a woman is dependent on this bodily function than on any other one incident of life.

MENSURATION, or the art of measuring, involves the construction of measures, the methods of using them, and the investigation of rules by which magnitudes which it may be difficult or impossible to measure directly are calculated from the ascertained value of some associated magnitude. It is usual, however, to employ the term mensuration in the last of these senses; and we may therefore define it to be that department of mathematical science by which the various dimensions of bodies are calculated from the simplest possible measurements.

The determination of the lengths and directions of straight lines, including what are familiarly known as problems in heights and distances, generally depends on the solution of triangles, and belongs to the science of **TRIGONOMETRY** and **SURVEYING**. The remaining portions of the subject are the determinations of the lengths of curves, the areas of plane or other figures, and the volumes and surfaces of solids.

In measuring any magnitude we select some standard or "unit" to measure by. Thus in measuring length we take for unit an inch, a foot, or a yard. From the unit of length we derive the units of area and volume. Thus we define the unit of area to be the area of the square described upon the unit of length, and the unit of volume to be the volume of the cube whose edge is the unit of length or whose side is the unit of area. For example, if an inch be taken as the unit of length, the square whose side is one inch, in the unit of area, and the cube whose edge is one inch is the unit of volume. The length of a line, the area of a surface, and the volume of a solid are then expressed by the numbers, whole or fractional, of units of length, area, and volume which they respectively contain. Hence, if l denote the linear unit, the length of a line which contains a units is al , or simply a since l is unity; similarly the area of a surface which contains b units of area is bm , or simply b , where m is the unit of area.

When two magnitudes have a common measure, that is, when another magnitude can be found which is contained in each an exact number of times, they are said to be "commensurable." If no common measure can be found, the two magnitudes are said to be "incommensurable."

MENTAL DISEASES. See **INSANITY**.

MENTON (Ital., *Mentone*), a cantonal capital in the department of Alpes-Maritimes, France, situated fifteen miles northeast of Nice, on the shores of the Mediterranean.

MENTZ. See **MAINZ**.

MENZEL, WOLFGANG, poet, critic, and historian, was born June 21, 1798, at Waldenburg, in Silesia, studied at Breslau, Jena, and Bonn, and after living for some time in Aarau and Heidelberg finally settled in Stuttgart, where, from 1830 to 1838, he had a seat in the Württemberg "landtag." He died April 23, 1873.

MEPHISTOPHELES, the name of one of the personifications of the principal of evil. The etymology of the word is uncertain. Probably it is of Hebrew origin, which view is supported by the fact that almost all the names of devils in the magic-books of the sixteenth century spring from the Hebrew. In the old Faust legends the character of Mephistopheles is simply that of a powerful and wicked being who fulfills Faust's commands in order to obtain possession of his soul. Marlowe attributes to him a certain dignity and sadness, and there can be little doubt that the Mephistophilis of the *Tragic History* suggested some important traits of Milton's Satan. The name has been made famous chiefly by Goethe, whose conception of the character varied at different periods of his career. In the fragment of *Faust* published in 1790, but written many years before, Mephistopheles has a clearly marked individuality; he is cynical and materialistic, but has a man's delight in activity and adventure, and his magical feats alone remind us that he is preternatural. In revising and extending this fragment, which forms the chief portion of the first part of *Faust*, Goethe treated Mephistopheles as the representative of the evil tendencies of nature, especially of the tendency to denial for its own sake, rather than as a living person.

MEQUINEZ (the Spanish form of the Arabic *Miknāsa*), a town of Morocco, the ordinary residence of the emperor, is situated in a fine hilly country about seventy miles from the west coast and thirty-five west-southwest of Fez, on the road to Salle. In 1900 it had about 35,000 population.

MERAN, a favorite health resort, and the capital of a district in South Tyrol, Austria, is picturesquely situated at the foot of the vine-clad Küchelberg, on the right bank of the Passer, about half a mile above its junction with the Adige, and forty-five miles to the south of Innsbruck.

MERCATOR, GERARDUS (Latinized form of Gerhard Krämer), mathematician and geographer, was born at Rupelmonde, in Flanders, May 5, 1512. Having completed his studies at Louvain, he devoted himself to geography, and, after being for some time attached to the household of Charles V., he was appointed cosmographer to the duke of Juliers and Cleves in 1559, taking up his residence at Duisburg, where he died December 2, 1594.

MERCURIAL AIR-PUMP. This name is given to two distinct instruments, one of which is founded on statical, the other on hydrodynamical principles.

The famous spiritualist Swedenborg was the first to conceive an air-pump in which a mass of mercury, by being made to rise and fall alternately within a vertical vessel, should do the work which in the ordinary instrument is assigned to the piston. He published a

description of his pump in 1722; but it is questionable whether his design was ever realized. Of numerous subsequent inventions the only one which, in fact, has survived is the admirably simple and yet efficient instrument first described in 1858, but constructed some time before, by H. Geisler of Bonn, which at once and justly met with universal acceptance.

The great advantage of the mercurial over the ordinary air-pump is that it evacuates far more completely than the latter, that it affords direct and unmistakable evidence of the exhaustiveness of its work, and—last, not least—that it enables one to transfer the gas sucked out to another vessel without loss or contamination, so that it can be measured and analyzed.

The Dynamic Pump was invented in 1865 by H. Sprengel. The great advantages of Sprengel's pump lie in the simplicity of its construction and in the readiness with which it adapts itself to the collecting of the gas.

MERCURY was the Roman god who presided over barter, trade, and all commercial dealings. His nature is probably more intelligible and simple than that of any other Roman deity. His very name, which is connected with *merx*, *mercator*, etc., shows that he is the god of merchandise and the patron of merchants. In the native Italian states, no merchants and no trade existed till the influence of the Greek colonies on the coast introduced Greek customs into the cities of the land. All the usages and terminology of trade, and all the religious ceremonies connected with it, were borrowed by the Romans from the Greeks. It was no doubt under the rule of the Tarquins, when the prosperity of the state and its intercourse with the outer world were so much increased, that merchants began to ply their trade in Rome. Doubtless the merchants practiced their religious ceremonies from the first, but their god Mercurius was not officially recognized by the state till the year 495 B. C. The Ides of May was chosen as the feast of Mercury, obviously because Maia was the mother of Hermes, i. e., of Mercury (see MAIA); and she was worshiped along with her son by the *mercuriales* on this day.

MERCURY, in chemistry, is a metal (symbol Hg) which is easily distinguished from all others by its being liquid at even the lowest temperatures naturally occurring in moderate climates. To this exceptional property it owes the synonyms of *quicksilver* in English and of *hydrargyrum* (from water and silver) in Græco-Latin.

Mercury occurs in nature chiefly in the form of a red sulphide, called cinnabar, which, as a rule, is accompanied by more or less of the reguline metal—the latter being probably derived from the former by some secondary reaction. The most important mercury mines in Europe are those of Almaden in Spain and of Idria in Illyria; these until lately furnished the bulk of the mercury of commerce, but they are now almost eclipsed by the rich deposits of New Almaden, in California. Considerable quantities of mercury are said to be produced in China and in Japan; minor deposits are being worked in the Bavarian Palatinate, in Hungary, Transylvania, Bohemia, and Peru. At Almaden the ore forms mighty veins traversing micaceous schists of the older transition period; in Illyria it is disseminated in beds of bituminous schists or compact limestone of more recent date.

Chemically speaking, the extraction of mercury from its ores is a simple matter. Metallic mercury is easily volatilized, and separated from the gangue, at temperatures far below redness, and cinnabar at a red heat is readily reduced to the metallic state by the action of iron or lime or atmospheric oxygen, the sulphur being eliminated, in the first case as sulphide of iron, in the second

as sulphide and sulphate of calcium, in the third as sulphurous acid gas.

Commercial mercury, as a rule, is very pure chemically, so that it needs only to be forced through chamois leather to become fit for all ordinary applications; but the metal, having the power of dissolving most ordinary other metals, is very liable to get contaminated with these in the laboratory or workshop, and requires then to be purified.

Mercurial preparations are largely employed as external applications. Several of them are potent agents for the destruction of the lower forms of animal life, and hence are employed to destroy parasites having their habitat in skin, hair, and clothing. The white and red precipitate ointments are specially effective in the destruction of pediculi, and blue ointment is occasionally used for the same purpose. Corrosive sublimate is, however, the most energetic of the mercurial parasitocides, and recent observations seem to show that it is superior to almost all other substances as a germ destroyer. It is sometimes used to get rid of ringworm. It should be remembered that corrosive sublimate is a powerful irritant to the skin, and also an active poison.

Acid nitrate of mercury is a caustic, and by its warts and small growths are sometimes removed; it is also one of the caustics occasionally applied to prevent the spread of lupus.

In skin diseases mercurial preparations are largely used, especially in some forms of eczema. A few grains of the red oxide or of ammoniated mercury in an ounce of zinc ointment are often found of great service in this ailment; citrine ointment is also useful. Calomel ointment is not irritating, but rather tends to soothe. It is therefore sometimes applied to irritable rashes; in puritus and it is of special value. Mercurial preparations are not usually found of benefit in scaly eruptions. In acne a weak solution of corrosive sublimate is often most effective.

Preparations of mercury are often used to heal ulcers, especially those of syphilitic origin. Black wash is one of the commonest applications for this purpose. The red oxide ointment is at times employed to stimulate indolent ulcers, and it is capable of removing exuberant granulations (proud flesh), which sometimes retard the healing of wounds.

Mercury is largely used externally to promote the absorption of inflammatory products, especially in the neighborhood of joints. The blue ointment is frequently employed for this purpose, more rarely a plaster containing mercury or a mercurial liniment. For effecting the absorption of goitre (Derbyshire neck) the ointment of the red iodide is often relied on, especially in India, where it is customary to expose the patient's neck to the sun after rubbing it with the ointment. In enlargements of the liver and spleen the application of mercurial ointment sometimes seems to promote reduction in size.

Taken internally in continued doses, mercury produces a peculiar effect known as salivation. First a metallic taste is experienced; this is followed by soreness of the gums, an undue flow of saliva, and fetor of the breath. Further administration of the drug may increase greatly the salivary flow, and also lead to swelling of the tongue, ulceration of the mouth, and even disease of the jaw-bone. At the same time the blood becomes impoverished, and feverishness with loss of flesh occurs. A single large dose—rarely, too, a single small dose—may produce some of the above symptoms. They may also follow the inhalation of the metal or its compounds, or their absorption through the skin. The long-continued inhalation of the vapor of mercury acts likewise on the nervous system, causing a peculiar kind

of trembling. Mercurial tremor is sometimes seen in looking-glass makers, often in those who work in quick-silver mines.

Internally mercury is chiefly given for two purposes — (1) to check inflammation and cause the absorption of the products it gives rise to, and (2) to antagonize the syphilitic virus and remove the evils it causes. Some years ago the belief in the power of mercury to control inflammation was almost universal, and it was largely administered in almost all inflammatory affections, but of late it has been much less used, both because it seems doubtful whether it has really the power it was once supposed to have and because of the possibility of evil results from its continued use. In peritonitis and iritis it is still often employed, small doses of calomel being given. Not infrequently, too, it is administered in pericarditis and hepatitis, but in pneumonia, pleurisy, and most other inflammatory affections its use is now discarded by many physicians. As an antidote to the syphilitic poison it is still held in high esteem, though opinions vary much as to the extent of its power. There can be little doubt that, given in an early stage of the disorder, it minimizes the secondary symptoms; but it cannot be relied on to prevent their occurrence. It aids in removing the secondary symptoms, and tends to the avoidance of tertiary manifestations, which nevertheless sometimes occur even when mercury has been freely given. The custom of giving mercury till profuse salivation is established has long been abandoned; the aim now is so to give it as to prevent salivation occurring; for this purpose blue pill, calomel, and corrosive sublimate are given in very small doses, but if the gums become tender the dose is decreased or the administration stopped.

Mercurial treatment is sometimes carried out by rubbing the blue ointment into the skin, sometimes by exposing the patient to the fumes of the calomel; syphilitic eruptions are often treated by such fumigation. More rarely mercury is introduced by injecting the albuminate or some other preparation under the skin or by means of suppositories. In children gray powder is generally used when mercurial treatment is required. Children bear mercury well.

Blue pill, calomel, and gray powder are often used as purgatives, and a power of promoting the secretion of bile is attributed to them. Experimentally it has not been proved that they stimulate the liver functions, but there is good reason for believing that they promote the expulsion of bile from the body. Gray powder is especially valued as a mild and efficient aperient for children, and is often given in the early stage of diarrhoea to expel the irritating contents of the bowel.

MERGANSER, a word originating with Gesner in 1555, and for a long while used in English as the general name for a group of fish-eating ducks possessing great diving powers, and forming the genus *Mergus* of Linnaeus, now regarded by ornithologists as a sub-family, *Merginae*, of the family *Anatidae*. The Mergansers have a long, narrow bill, with a small but evident hook at the tip, and the edges of both mandibles beset by numerous horny denticulations, whence in English the name of "Saw-bill" is frequently applied to them. Otherwise their structure does not much depart from the anatine or fuliguline type. All the species bear a more or less developed crest or tuft on the head. Three of them, *Mergus merganser* or *castor*, *M. serrator*, and *M. albellus*, are found over the northern parts of the Old World, and of these the first two also inhabit North America, which has besides a fourth species, *M. cucullatus*. *M. merganser*, commonly known as the Goosander, is the largest species, being nearly as big as the smaller geese.

Often associated with the Mergansers is the genus

Merganetta, the so-called Torrent-Ducks of South America, of which three species are said to exist; they possess spiny tails and have their wings armed with a spur.

MERGUI, a district of British Burmah, forms the southernmost district of the Tenasserim division, and is bounded on the north by Tavoy, east and south by Siam, and west by the Bay of Bengal, with an area of 7,810 square miles.

MERGUI, chief town of the above district, is situated on an island at the mouth of the Tenasserim river. The population (about 11,000) consists of many races—Talaings, Burmese, Malays, Bengalis, Madrasis, Siamese, and Chinese.

MÉRIDA, a city of 7,390 inhabitants in the province of Badajoz, Spain, lies about thirty-six miles by rail eastward from Badajoz, on the Madrid and Badajoz line, on a small eminence on the right bank of the Guadiana.

MARIDA, the capital of the Mexican State of Yucatan, stands in a great plain in the north of the peninsula, on a surface of limestone rock, about twenty-five miles from the port of Progreso, on the Gulf of Mexico, with which it is connected by a railway opened in 1880. The population, estimated about 1840 as 25,000, was found in 1899 to number 39,000.

MERIDEN, a city of the United States, in New Haven county, Conn., eighteen miles from New Haven by rail. It is a busy manufacturing town; the population had increased from 3,559 in 1850 to 24,296 in 1900. The Britannia Company alone employs upward of 1,000 hands, and sends out every year nearly \$3,000,000 worth of Britannia metal and electroplated goods; and tinware, cutlery, brass-work, flint glass, guns, and woollen goods are also manufactured in the town. The State reform school is located here. A fortified tavern erected by Belcher in 1660, on the road between Boston and New Haven, was the nucleus of Meriden; but the place was not incorporated as a town till 1856, and became a city in 1867.

MERIDIAN, a Mississippi town, in Lauderdale county, of which it is the capital, is a growing community (1900) of 14,050 population. It has banks, churches; two female colleges besides other schools, railroads, telegraphs, etc. It has manufactures of sash, blinds, furniture, etc., and several newspapers are published.

MÉRIMÉE, PROSPER, novelist, archæologist, essayist, and in all these capacities one of the greatest masters of French style during the century, was born at Paris on September 28, 1803, and died at Cannes on the 23d of the same month sixty-seven years later, having lived just long enough to know that ruin was threatening France. In 1825 he published what purported to be the dramatic works of a Spanish lady, Clara Gazul, with a preface stating circumstantially how the supposed translator, one Joseph L'Estrange, had met the gifted poetess at Gibraltar. This was followed by a still more audacious and still more successful *supercherie*. In 1827 appeared a small book entitled *La Guzla* (the anagram of Gazul), and giving itself out as translated from the Illyrian of a certain Hyacinthe Maglanovich. In the next year appeared a short dramatic romance, *La Jacquerie*. This in its turn was followed by a still better piece, *Chronique de Charles IX*. All these works were to a certain extent second hand, being either directly imitated or prompted by a course of reading on a particular subject.

He had already obtained a considerable position in the civil service, and after the revolution of July he was *chef de cabinet* to two different ministers. Mérimée was a born archæologist. He also devoted himself to

history proper during the latter years of the July monarchy, and published numerous essays and works of no great length, chiefly on Spanish, Russian, and ancient Roman history. He did not, however, neglect novel writing during this period, and numerous short tales, almost without exception masterpieces, appeared, chiefly in the *Revue de Paris*. He had been elected to the Academy in 1844, and also to the Academy of Inscriptions, of which he was a prominent member. Between 1840 and 1850 he wrote more tales, the chief of which were *Arsène Guillot* and *Carmen*.

The empire made a considerable difference in Mérimée's life. He was made a senator, and continued to exercise his archaeological functions; but his most important rôle was that of a constant and valued private friend of both the "master and mistress of the house," as he calls the emperor and empress in his letters. He was occasionally charged with a kind of irregular diplomacy, and once, in the matter of the emperor's *César*, he had to pay the penalty frequently exacted from great men of letters by their political or social superiors who are ambitious of literary reputation. But for the most part he was strictly the "ami de la maison." His occupations during the last twenty years of his life were numerous and important, though rather nondescript. He found, however, time for not a few more tales, and for two correspondences, which are not the least of his literary achievements, while they have an extraordinary interest of matter. One of these consists of the letters which have been published as *Lettres à une Inconnue*, the other of the letters addressed to Sir Antonio Pizzini, the late librarian of the British Museum.

MERINO. See SHEEP and WOOL.

MERIONETH, a maritime county of North Wales, is bounded north by Carnarvon and Denbigh, southeast by Denbigh and Montgomery, and west by Cardigan Bay. It is triangular in shape, its greatest length northeast to southwest being forty-five miles, and its greatest breadth northwest to southeast about thirty miles. The area is 385,291 acres, or about 660 square miles.

The climate varies much with the elevation, in some places being bleak and cold, and in others remarkably equable and genial.

According to the agricultural returns for 1882, there were 154,406 acres, or considerably less than half the total area, under cultivation.

Woolen goods are manufactured in various places, especially at Dolgelly. They are principally coarse druggets, kerseymeres, and flannels.

The county returns one member to parliament. There is no municipal or parliamentary borough. The towns returned in 1881 as urban sanitary districts are Bala (1,653), Barmouth (1,512), Dolgelly (2,457), Festiniog (11,272), and Townyn (3,363). Since 1801 the population has nearly doubled. In 1901 it was 48,774, of whom 24,566 were males, and 24,208 females.

MERLIN. See FALCON.

MERMAIDS and MERMEN, in the popular mythology of England and Scotland, are a class of beings more or less completely akin to man, who have their dwelling in the sea, but are capable of living on land and of entering into social relations with men and women. The typical mermaid (who is much more frequently described than the merman) has the head and body of a woman, usually of exceeding loveliness, but below the waist is fashioned like a fish with scales and fins. Her hair is long and beautiful, and she is often represented, like the Russian rusalka, as combing it with one hand while in the other she holds a looking-glass.

In relation to man the mermaid is usually of evil issue if not of evil intent. She has generally to be bribed or compelled to utter her prophecy or bestow her gifts, and whether as wife or paramour she brings disaster in her train. In itself her sea-life is often represented as one of endless delights, but at other times a mournful mystery and sadness broods over it. The fish-tail, which in popular fancy forms the characteristic feature of the mermaid, is really of secondary importance; for the true Teutonic mermaid—probably a remnant of the great cult of the Vanir—had no fish-tail; and this symbolic appendage occurs in such remote mythological regions as to give no clue to historical connection.

Quasi-historical instances of the appearance or capture of mermaids are common enough, and serve, with the frequent use of the figure on signboards and coats of arms, to show how thoroughly the myth had taken hold of the popular imagination.

MEROE, in classical geography, was the metropolis of Æthiopia, situated on an island of the same name between the Nile and the Astaboras (Atbara). The "island" is only an inaccurate name for the fertile plain between the two rivers. This Meroe, first mentioned by Herodotus, succeeded an older Ethiopian kingdom of Napata lower down the Nile, originally subject to and civilized from Egypt, but which afterward became independent and even sent forth an Ethiopian dynasty to reign in Egypt, to which the So and Tihaka of the Bible belonged (see ETHIOPIA). The name of Meroe in the form Merawi is now given to Napata.

MERSEBURG, the chief town of a district of the same name in the Prussian province of Saxony, is situated on the river Saale, ten miles to the south of Halle and seventeen to the west of Leipsic. It consists of a quaint and irregularly built old town, with two extensive suburbs, and contains six churches and several schools and charitable institutions. Its population in 1900 was about 17,000.

Merseburg (*i.e.*, "march-town") is one of the oldest towns in Germany. The great victory gained by the emperor Henry I. over the Huns in 933 is believed to have been fought on the Keuschberg near Merseburg.

MERTHYR TYDFIL, or MERTHYR TYDVIL, a parliamentary borough and market-town of Glamorganshire, South Wales, is situated in a bleak and hilly region on the river Taff, and on several railway lines, twenty-five miles north-northwest of Cardiff and thirty east-northeast of Swansea.

MERV, MERU, or MAOUR, a district of Central Asia, situated on the border-land of Iran and Turan. The oasis of Merv lies in the midst of a desert. It is about 250 miles from Herat, 170 from Charjui on the Oxus, 360 from Khiva, and 175 from Gawars, the nearest point in the Russian territory of Akhal.

Whether as a satrapy of Darius and subsequently as a province of Alexander, whether as the home of the Parthian race, whether as a bulwark against the destructive waves of Mongol invasion, or later as the glaciis of Persian Khorasan, the valleys of those rivers—the district of Merv—have ever been important outposts on the borders of Iran. In bygone epochs their banks have, under powerful rulers, been studded with populous and flourishing cities, which bore the name of "Sovereign of the Universe," and vied for fame with "Balkh, the Mother of cities;" of late times, with weakness or absence of government, those same banks have become choked with fallen battlements and ruins, the home of the snake and the jackal.

The present inhabitants of the district are Turcomans of the Tekke tribe, who, like the other tribes inhabiting Turcomania, enjoyed, until the approach of the Russians, virtual independence, and acknowledged allegi-

ance to no one—a pastoral people who eked out a miserable existence by the trade of passing caravans, and in bad times pillaged the neighboring and equally barbarous states, to whose reprisals they were in turn subjected.

From the year 1869, the date of the establishment of the Russian military settlement at Krasnovodsk on the east shore of the Caspian, the wave of Russian conquest has gradually swept eastward along the northern frontier of Persia until it has for the moment stopped at the outermost border of the Akhal Turcoman country, which was incorporated in 1881 by Russia as the result of the defeat of that tribe at Geok Tepe. Among the districts still further east, to which the Russians give the name of Eastern Turcomania, is that of the Merv Tekke Turcomans, kinsmen of the Akhal Tekkes, the most recent of Russia's subjects. The district of the Merv Tekkes may be taken to be that included between the lower Murghab below Yulutan, where the river enters the plain, and the Persian frontier from Sarakhs to Gawars.

A reference to the map will show the strategical importance of this district, situated at the point of meeting of two lines, of which one is the strategic line of Russian advance on Herat from Krasnovodsk to Sarakhs, and the other the strategic line of advance on the same place from Tashkend through Bokhara. The capital of the district is, moreover, the crossing-point of the Herat-Khiva and Meshed-Bokhara trade routes.

Consequently this district, a solitary oasis in a vast desert, guarantees to its possessor the command of an important avenue between north and south, and, in the event of its falling into Russian hands, will give that power in addition a valuable link in the chain of connection between her recent acquisitions on the Persian frontier and those in Turkestan, the forging of which has been persistently advocated by Russian writers for years past. One of these, Colonel Veniukoff, frankly admits that it is the political results—"the consolidation of friendly relations with the Turcomans"—and not commercial interests merely, that are primarily looked to, and openly states that the forward movement in Central Asia "cannot end otherwise than by the annexation to Russia of the whole of Turan."

Whether by design or by the force of circumstances, the recommendations of those writers have been translated into facts, and Russia with her advanced post at Askabad is now within 400 miles of Herat, which Sir Henry Rawlinson designates as the key of India. The occupation of the Merv Tekke country would bring Russia to within 250 miles of Herat. From Askabad she is in connection with the Caspian by a good line of communication, part of which (from the sea to Kizil Arvat) is by rail; and hence facilities are offered for bringing up not only the resources of the Caucasus but of the whole of European Russia. While Russian troops are within 400 miles of Herat, the British troops at Quetta are more than 500 miles from Herat.

These remarks serve to explain the very natural suspicion with which Great Britain has regarded the occupation one after another of important strategical points along that route by which alone Russia can strike at India—the same line by which Napoleon meditated a Russo-French invasion in the early part of this century.

MÉRYON, CHARLES. The name of Méryon is associated with that spirited revival of etching in France which took place in the middle of the nineteenth century—say from 1850 to 1865—but it is rather by the individuality of his own achievements, and the strength of his artistic nature, than by the influence he exercised that Méryon best deserves fame.

Charles Méryon was born in Paris in 1821. Having

proved himself a surprising copyist, he proceeded to labor of his own, and began that series of etchings which are the greatest embodiments of his greatest conceptions—the series called "Eaux-fortes sur Paris." These plates, executed from 1850 to 1854, are never to be met with as a set; they were never expressly published as a set.

Besides the twenty-two etchings "sur Paris," Méryon did seventy-two etchings of one sort and another—ninety-four in all being catalogued in Wedmore's *Méryon and Méryon's Paris*. A very few years after the completion of his Paris series, he was lodged in the madhouse of Charenton. Its order and care restored him for awhile to health, and he came out and did a little more work, but at bottom he was exhausted. In 1867 he returned to his asylum, and died there in 1868.

MESCHERYAKS, or **MESCHERS**, a people inhabiting Eastern Russia. Nestor regarded them as Finns, and even now part of the Mordvinians (of Finnish origin) call themselves Meschers. Klaproth, on the other hand, supposed they were a mixture of Finns and Turks, and the Hungarian traveler Reguli discovered that the Tartarized Meschers of the Obi closely resembled Hungarians. They formerly occupied the basin of the Oka (where the town Meschersk, now Meschovsk, has maintained their name) and of the Sura, extending northeast to the Volga. After the conquest of the Kazan empire by Russia, part of them migrated northeastward to the basins of the Kama and Byelaya, and thus the Meschers divided into two branches. The western branch became Russified, so that the Mescheryaks of the governments of Penza, Saratoff, Ryazan, and Vladimir have adopted the customs, language, and religion of the conquering race; but their ethnographical characteristics can be easily distinguished in the Russian population of the governments of Penza and Tamboff. The eastern branch has taken on the customs, language, and religion of Bashkirs, with whom their fusion is still more complete. They can be distinguished from their neighbors only by their more peaceful character.

MESCHOVSK, a district town of Russia, in the government of Kaluga, forty-five miles to the southwest of the capital of the province.

MESHĒD (properly Mesh-hed, *i.e.*, "place of martyrdom," "shrine"), a city of northern Persia, capital of Khorásán, 472 miles east of Tehrán, 201 miles northwest of Herat, lies on a plain watered by the Keshaf-rúd, a tributary of the Heri-rúd, and is surrounded by mud walls four miles in circumference, with a dry ditch forty feet deep at some points, which could be flooded from the neighboring reservoir and water-courses. Within this inclosure is a strong citadel, with good walls twenty-five feet high, residence of the prince governor of Khorásán. Population, 70,000.

MESHED-ALI, *i.e.*, the shrine of the "martyr" Ali, is a town of Asiatic Turkey, province of Bagdad, fifty miles south of Kerbela, close to the ruins of Kufa, and two miles west of the Hindiye branch of the Euphrates, the reputed burial-place of the caliph Ali. It stands on the east scarp of the Syrian desert, and is inclosed by nearly square brick walls flanked by massive round towers dating from the time of the caliphs. Under the gilded dome of the great mosque, which occupies the center of the town, is the shrine of Ali, which is held by the Shí'a as at least as holy as the Kaaba itself. Any Moslem buried within sight of the dome being certain of salvation, large numbers of bodies are yearly sent from all parts for interment here.

MESHED HOSEIN, properly **MESHĒD HOSEIN**. See **KERBELA**.

MESMER, **MESMERISM**. See **MAGNETISM**.

MESOPOTAMIA, the "country between the rivers,"

is a purely geographical expression, the countries which it comprehends never having formed a self-contained political unity. It was first introduced by the Greeks at or after the time of Alexander, but probably had its origin in the earlier Aramaean name *bēth nahrin* (the country between the rivers), to which again corresponds the Biblical *Aram Naharayim*. As early as 700 B.C. "the country of two rivers" is mentioned on the Egyptian monuments under the name Naharina, but no such designation appears in the cuneiform inscriptions (though the territory formed part of the Assyrian as it afterward did of the Persian empire). The most settled period in the history of Mesopotamia was probably under Persian-Greek rule. Xenophon applies the name Syria to the extremely fertile district which he traversed after having crossed the Euphrates at Thapsacus. The country beyond the Araxes he calls Arabia—a desert region in which his army had to suffer great hardships until it reached the "gates of Arabia." Even in later times Mesopotamia was included under the name Assyria, or was reckoned part of Babylonia.

It appears that Mesopotamia reaches its northern limits at a point where the EUPHRATES (*q.v.*) and the Tigris break through the mountain range and enter the lowlands. In the case of the Euphrates this takes place at Sumeisât (Samosat), and that of the Tigris near Jezret ibn 'Omar (Bezabdá) and Mosul (Nineveh). Consequently the irregular northern boundaries are marked by the lowland limits of those spurs of the Taurus mountains known in antiquity as Mons Masius and now as Karaje Dâgh and Túr 'Abdîn. Toward the south the ancient boundary was the so-called Median Wall, which, near Pirux Shapur, not much to the south of Hî (the ancient Is), crossed from the Euphrates in the direction of Kadiya (Opis) to the Tigris. There the two rivers approach each other, to diverge again lower down. At the same place begins the network of canals connecting the two rivers which rendered the country of Babylonia one of the richest in the world; there, too, in a geological sense, the higher portion of the plain, consisting of strata of gypsum and marl, comes to an end; there at one time ran the line of the sea-coast; and there begin those alluvial formations with which the mighty rivers in the course of long ages have filled up this depressed area. Mesopotamia thus forms a triangle lying in the northwest and southeast direction, with its long sides toward the north and southwest, and has an area of some 55,200 square miles.

The south or steppe portion of Mesopotamia was from early times the roaming-ground of Arabic tribes; for Xenophon gives the name of Arabia to the district on the left bank of the Euphrates to the west of the Khâbûr; and elsewhere it is frequently stated that the interior at a distance from the rivers was a steppe inhabited by Arabes Scenitæ (Tent Arabs).

It appears that Mesopotamia, like Syria, constitutes an intermediate territory between the great eastern and western monarchies—Syria inclining more to the west, and Mesopotamia to the east. In virtue of its position it frequently formed both the object and the scene of contest between the armies of those mighty monarchies, and it is wonderful how a country so often devastated almost always recovered. The roads, it is true, which traversed the territory were not mere military highways, but the main routes of traffic for Central Asia, Western Asia, and Europe. It is only in modern times, and since these lines of commercial intercourse have ceased to be followed, that the general condition of things has been so entirely altered.

MESSENE, the chief city of Messenia, founded, under the auspices of Epaminondas, as a bulwark against the Spartans. After the battle of Leuctra that

general sent to all the exiled Messenians—in Africa, Sicily, or Italy—and invited them to return to the land of their fathers. Many came with eagerness, and in 369 B.C. the city was built by the combined army of Thebans under Epaminondas and Argives under Epitales, assisted by the Messenians themselves. The site was chosen in conformity with a vision which appeared to Epaminondas, and the walls were raised to the sound of flutes playing the airs of Sacadas and Pronomus. The citadel was erected on the summit of Mount Ithome, and the city on its southern slope and in the adjoining valley.

MESSENIA (in Homer Messene), a state of Greece, and most westerly of the three peninsulas of the Peloponnesus. Its area is a little over 1,160 square miles. It is separated from Elis and Arcadia on the north by the Neda and the Nomian mountains, and from Laconia on the east by the lofty range of Taygetus. The other sides are washed by the sea, which indents its shores with four gulfs or bays—Messenia, Phœnicus, Pylus, and Cyparissus. Pop. (1896), 205,798.

The earliest inhabitants of Messenia were Leleges, whose capital was at Andania. After these came Ætolians, whose chief center was at Pylus. After the Dorian conquest the country was divided by Cresphontes into five parts, whose chief cities were respectively Stenyclarus, Pylus, Rhion, Hyamia, and Mesola. The towns of Messenia were not numerous.

MESSIAH and MESSIAS, are transcriptions of the Greek, which in turn represents the Aramaic *mēshîhâ*, answering to the Hebrew, "the anointed." The Hebrew word with the article prefixed occurs in the Old Testament only in the phrase, "the anointed priest," but "Jehovah's anointed" is a common title of the king of Israel, applied in the historical books to Saul and David, in Lam. iv. 20, to Zedekia, and in Isa. xlv. 1 extended to Cyrus. In the Psalms corresponding phrases (My, Thy, His anointed) occur nine times, to which may be added the lyrical passages 1 Sam. ii. 10, Hab. iii. 13.

The hope of the advent of an ideal king was only one feature of that larger hope of the salvation of Israel from all evils, the realization of perfect reconciliation with Jehovah, and the felicity of the righteous in Him, in a new order of things free from the assaults of hostile nations and the troubling of the wicked within the Hebrew community, which was constantly held forth by all the prophets, from the time when the great seers of the eighth century B.C. first proclaimed that the true conception of Jehovah's relation to His people was altogether different from what was realized, or even aimed at, by the recognized civil and religious leaders of the two Hebrew kingdoms, and that it could become a practical reality only through a great deliverance following a sifting judgment of the most terrible kind. The idea of a judgment so severe as to render possible an entire breach with the guilty past, and of a subsequent complete realization of Jehovah's kingship in a regenerate nation, is common to all the prophets, but is expressed in a great variety of forms and images, conditioned by the present situation and needs of Israel at the time when each prophet spoke. As a rule the prophets directly connect the final restoration with the removal of the sins of their own age, and with the accomplishment of such a work of judgment as lies within their own horizon; to Isaiah the last troubles are those of Assyrian invasion, to Jeremiah the restoration follows on the exile to Babylon; Daniel connects the future glory with the overthrow of the Greek monarchy. The details of the prophetic pictures show a corresponding variation; but all agree in giving the central place to the realization of a real effective kingship of Jehovah; in fact the conception of the religious subject as the

nation of Israel, with a national organization under Jehovah as king, is common to the whole Old Testament, and forms the bond that connects prophecy proper with the so-called Messianic psalms and similar passages which theologians call typical, *i.e.*, with such passages as speak of the religious relations of the Hebrew commonwealth, the religious meaning of national institutions, and so necessarily contain ideal elements reaching beyond the empirical present. All such passages are frequently called Messianic; but the term is more properly reserved as the specific designation of one particular branch of the Hebrew hope of salvation, which, becoming prominent in post-canonical Judaism, used the name of the Messiah as a technical term (which it never is in the Old Testament), and exercised a great influence on New Testament thought—the term “the Christ” being itself nothing more than the translation of “the Messiah.”

MESSINA, a city and seaport at the northeast corner of Sicily, capital of the province of the same name, is situated on the Straits of Messina (at this point about four miles wide), eight miles northwest of Reggio and 130 miles east by north of Palermo. The town is built between the sea and a range of sharp and rugged hills, called the Dinnamare, 3,707 feet at their highest point. It runs in a semicircle around the harbor, and presents a picturesque appearance from the sea, as the houses rise in tiers upon the slope of a hill, and behind are the wooded mountains.

Messina is the second town of Sicily in importance and in size. Its population was 97,074 in 1850, 111,854 in 1871, and 149,823 in 1901. It is an archiepiscopal see, and has a university, founded by the Jesuits in 1548, with a public library of 56,000 volumes.

The history of Messina begins very early. It is said to have been founded on the site of a more ancient Sicilian town, by pirates from Cumæ, in 732 B.C.

METALLURGY, a branch of applied science whose object is to describe and scientifically criticise the methods used industrially for the extraction of metals from their ores. Of the large number of metals enumerated in the handbooks of chemistry, the vast majority, of course, lie outside its range; but it is perhaps as well to point out that in metallurgic discussion even the term “metallic,” as applied to compounds, has a restricted meaning, being exclusive of all the light metals, although one of these, namely aluminium, is being manufactured industrially. The history of metallurgy, up to the most recent times, is obscure. It is only since about the beginning of this century that the art has come to be at all scientifically criticised; and in the case of the most important processes all that science has been able to do has been merely to put her stamp upon what experience has long found to be right. Great and brilliantly successful scientific efforts in the synthetic line are not wanting, but they all belong to recent times. Science, by its very nature, aims at publicity; empiricism at all times has done the reverse; hence a history of the development of the art of metallurgy does not and cannot exist. A few historical notes on the discovery of certain of the useful metals are given in the introduction to METALS (*q.v.*)

Occasionally metallic ores present themselves in the shape of practically pure compact masses, from which the accompanying matrix or “gangue” can be detached by hand and hammer. But this is a rare exception. In most cases the “ore,” as it comes out of the mine, is simply a mixture of ore proper and gangue, in which the latter not infrequently predominates so much that it is not the gangue but the ore that really occupies the position of what the chemist would call the impurity. Hence, in general, it is necessary, or at least expedient,

to purify the ore as such before the liberation of the metal is attempted. Most metallic ores are specifically heavier than the impurities accompanying them, and their purification may be (and generally is) effected by reducing the crude ore to a fine enough powder to detach the metallic from the earthy part, and then washing away the latter by a current of water, as far as possible. In the case of a “reguline” ore, such as auriferous quartz, for instance, the ore thus concentrated may consist substantially of the metal itself, and require only to be melted down and cast into ingots to be ready for the market. This, however, is a rare case, the vast majority of ores being chemical compounds, which for the extraction of their metals demand chemical treatment. The chemical operations involved may be classified as follows:—

Fiery Operations.—The ore, along in general with some kind of “flux,” is exposed to the direct action of a powerful fire. The fire in most cases has a chemical, in addition to its obvious physical function. It is intended either to burn away certain components of the ore—in which case it must be so regulated as to contain a sufficient excess of unburned oxygen; or it is meant to deoxidize (“reduce”) the ore, when the draught must be restricted so as to keep the ore constantly wrapped up in combustible flame gases, (carbonic oxide, hydrogen, marsh-gas, etc.) The vast majority of the chemical operations of metallurgy fall into this category, and in these processes other metal-reducing agents than those naturally contained in the fire (or wind) are only exceptionally employed.

Amalgamation.—The ore by itself (if it happens to be a reguline ore), or the ore plus certain reagents (if it does not), is worked up with mercury so that the metal is obtained ultimately as an amalgam, which can be separated mechanically from the dross. The purified amalgam is subjected to distillation, when the mercury is recovered as a distillate while the metal remains.

Wet Processes.—Strictly speaking, certain amalgamation methods fall under this head; but, in its ordinary acceptance, the term refers to processes in which the metal is extracted either from the natural ore, or from the ore as it is after roasting or some other preliminary treatment, by means of an aqueous acid or salt solution, and from this solution precipitated—generally in the reguline form—by some suitable reagent.

Few methods of metal extraction at once yield a pure product. What as a rule is obtained is a more or less impure metal, which requires to be “refined” to become fit for the market.

METALS. The earliest evidence of a knowledge and use of metals is found in the prehistoric implements of the so-called Bronze and Iron ages. In the earliest periods of written history, however, we meet with a number of metals in addition to these two. The Old Testament mentions six metals—gold, silver, copper, iron, tin, and lead. The Greeks, in addition to these and to bronze, came also to know mercury; and the same set of metals, without additions, forms the list of the Arabian chemists of the eighth and of the Western chemists of the thirteenth century. During the fifteenth century Basilus Valentinus discovered antimony; he also speaks of zinc and bismuth, but their individuality was established only at a later period. About 1730–40 the Swede Brand discovered arsenic and cobalt (the former is not reckoned a metal by modern chemists), while the Englishman Ward recognized the individuality of platinum. Nickel was discovered in 1774 by Cronstedt, manganese in 1774 by Scheele. The brothers d’Elhujart, 1783, prepared tungsten; Hjelm, in 1782, isolated molybdenum from molybdic oxide, where its existence had been conjecturally asserted by Berg

mann in 1781. Uranium, as a new element, was discovered by Klaproth in 1789; but his metallic "uranium," after having been accepted as a metal by all chemists until 1841, was then recognized as an oxide by Pélignot, who subsequently isolated the true metal. Tellurium was discovered by Müller von Reichenbach in 1782 (again by Klaproth in 1798); titanium, by Klaproth in 1795; chromium, by Vauquelin in 1797; tantalum, by Hatchett in 1801, and by Ekeberg in 1802. Palladium, rhodium, iridium, and osmium (which four metals always accompany platinum in its ores) were discovered, the first two by Wollaston in 1803, the other two by a number of chemists; but their peculiarity was established chiefly by Smithson Tennant.

After Davy, in 1807 and 1808, had recognized the alkalis and alkaline earths as metallic oxides, the existence of metals in all basic earths became a foregone conclusion, which was verified sooner or later in all cases. But the discovery of aluminium by Wöhler in 1828, and that of magnesium by Bussy in 1829, claim special mention. Cadmium, a by no means rare heavy metal, was discovered only in 1818 by Stromeyer.

Of the large number of discoveries of rare metals which have been made in the more recent times only a few can be mentioned as marking new departures in research or offering other special points of interest. In 1861 Bunsen and Kirchhoff, by means of the method of spectrum analysis, which they had worked out shortly before, discovered two new alkali-metals which they called cesium and rubidium. By means of the same method Crookes, in 1861, discovered thallium; Reich and Richter, in 1863, indium; and Lecoq de Boisbaudran, in 1875, gallium. The existence of the last-named metal had been maintained, theoretically, by Mendelejeff, as early as 1871. The existence of vanadium was proved in 1830 by Sefström; but what he, and subsequently Berzelius, looked upon as the element was, in 1867, proved to be really an oxide by Roscoe, who also succeeded in isolating the true metal.

The development of earlier notions on the constitution of metals and their genetic relation to one another forms the most interesting chapter in the history of chemistry (see *ALCHEMY*). What modern science has to say on the subject is easily stated: all metals properly so called (*i.e.*, all metals not alloys) are elementary substances; hence chemically speaking, they are not "constituted" at all, and no two can be related to each other genetically in any way whatever. Our scientific instinct shrinks from embracing this proposition as final; but in the meantime it must be accepted as correctly formulating our ignorance on the subject. All metallic elements agree in this, that they form at least one basic oxide, or, what comes to the same thing, one chloride, stable in opposition to liquid water. This at once suggests an obvious definition of metals as a class of substances, but the definition would be highly artificial and objectionable on principle, because when we speak of metals we think, not of their accidental chemical relations, but of a certain sum of mechanical and physical properties which unites them all into one natural family. What these properties are we shall now endeavor to explain.

All metals, when exposed in an inert atmosphere to a sufficient temperature, assume the form of liquids, which all present the following characteristic properties:—They are (at least practically) non-transparent; they reflect light in a peculiar manner, producing what is called "metallic luster." When kept in non-metallic vessels they take the shape of a convex meniscus. These liquids, when exposed to higher temperature, some sooner, others later, pass into vapors. What these vapors are like is not known in many cases, since, as a rule, they can be

produced only at very high temperatures, precluding the use of transparent vessels. Silver vapor is blue, potassium vapor is green, many others (mercury vapor, for instance) are colorless. The liquid metals, when cooled down sufficiently, some at lower, others at higher temperatures, freeze into compact solids, endowed with the (relative) non-transparency and the luster of their liquids. These frozen metals in general form compact masses consisting of aggregates of crystals belonging to the regular or rhombic or (more rarely) the quadratic system. But in many cases the crystals are so closely packed as to produce an apparent absence of all structure. Compared with non-metallic solids, they in general are good conductors of heat and of electricity. But their most characteristic, though not perhaps their most general, property is that they combine in themselves the apparently incompatible properties of elasticity and rigidity on the one hand and plasticity on the other. To this remarkable combination of properties more than to anything else the ordinary metals owe their wide application in the mechanical arts. In former times a high specific gravity used to be quoted as one of the characteristics of the genus; but this no longer holds, since we have come to know of a whole series of metals which float on water. Let us now proceed to see to what degree the mechanical and physical properties of the genus are developed in the several individual metals.

Non-Transparency.—This, in the case of even the solid metals, is perhaps only a very low degree of transparency. In regard to gold this has been proved to be so; gold leaf, or thin films of gold produced chemically on glass plates, transmit light with a green color. On the other hand, those infinitely thin films of silver which can be produced chemically on glass surfaces are absolutely opaque. Very thin films of liquid mercury, according to Melsens, transmit light with a violet-blue color; also thin films of copper are said to be translucent. Other metals, so far as we know, have not been more exactly investigated in this direction.

Color.—Gold is yellow; copper is red; silver, tin, and some others are pure white; the majority exhibit some modification or other of gray.

Reflection of Light.—Polished metallic surfaces, like those of other solids, divide any incident ray into two parts, of which one is refracted while the other is reflected—with this difference, however, that the former is completely absorbed, and the latter, in regard to polarization, is quite differently affected. The degree of absorption is different for different metals.

Crystalline Form.—Most (perhaps all) metals are capable of crystallization, and in most cases isolated crystals can be produced by judiciously managed partial freezing.

Structure.—Perhaps all metals, in the shape which they assume in freezing, are crystalline, only the degree of visibility of the crystalline arrangement is very different in different metals, and even in the same metal varies according to the slowness of solidification and other circumstances.

Closely related to the structure of metals is their degree of "plasticity" (susceptibility of being constrained into new forms without breach of continuity). This term of course includes as special cases the qualities of "malleability" (capability of being flattened out under the hammer) and "ductility" (capability of being drawn into wire); but it is well at once to point out that these two special qualities do not always go parallel to each other, for this reason among others that ductility in a higher degree than malleability is determined by the tenacity of a metal. Hence tin and lead, though very malleable, are little ductile. The quality of plasticity is developed to very different degrees in dif-

ferent metals, and even in the same species it depends on temperature, and may be modified by mechanical or physical operations.

What we have called plasticity must not be mixed up with the notion of softness, which means the degree of facility with which the plasticity of a metal can be discounted.

Elasticity.—All metals are elastic to this extent, that a change of form, brought about by stresses not exceeding certain limit values, will disappear on the stress being removed. Strains exceeding the "limit of elasticity" result in permanent deformation or (if sufficiently great) in rupture.

Color.—Most metals are white or gray; so are the alloys of these metals with one another. Gold alloys generally exhibit something like the shade of yellow which one would expect from their composition; its amalgams, however, are all white, not yellow. Copper shows little tendency to impart its characteristic red color to its alloys with white or gray metals. Thus, for instance, the silver alloy up to about 30 per cent. of copper exhibits an almost pure white color. The alloys of copper with zinc (brass) or tin (bronze) are reddish-yellow when the copper predominates largely. As the proportion of white metal increases, the color passes successively into dark yellow, pale yellow, and ultimately into white. Aluminium bronze, containing from 5 to 10 per cent. of aluminium, is golden-yellow.

Plasticity.—This quality is most highly developed in certain pure metals, notably in gold, platinum, silver, and copper. Of platinum alloys little is known. The other three, on uniting with one another, substantially retain their plasticities, but the addition of any metal outside the group leads to deterioration. Thus, for instance, according to Karsten, copper by being alloyed with as little as 0.6 per cent. of zinc, loses its capability of being forged at a red heat; it cracks under the hammer. Antimony or arsenic to the extent of 0.15 per cent. renders it unfit for being rolled into thin sheet or drawn out into fine wire, and makes it brittle in the heat; 0.1 per cent. of lead prohibits its conversion into leaf.

Hardness, Elasticity, Tensile Strength.—In reference to these qualities, we shall confine ourselves to some very striking changes for the better which the metals, (1) gold, (2) silver, (3) copper, suffer when alloyed with moderate proportions (10 per cent. or so) of (1) copper, (2) copper, (3) tin, zinc, or aluminium respectively. Any of these five combinations leads to a considerable increase in the three qualities named, although these are by no means highly developed in the added metals; most strikingly it does so in the case of aluminium bronze (copper and aluminium), which is so hard as to be very difficult to file, and is said to be equal in tensile strength to wrought iron.

Hydrogen, as was shown by Graham, is capable of uniting with (always very large proportions of) certain metals, notably with palladium, into metal-like compounds. But those hydrogen alloys, being devoid of metallurgic interest, fall better under the heading **PALLADIUM**.

Oxygen.—Mercury and copper (perhaps also other metals) are capable of dissolving their own oxides with formation of alloys. Mercury, by doing so, becomes viscid and unfit for its ordinary applications. Copper, when pure to start with, suffers considerable deterioration in plasticity. But the presence of moderate proportions of cuprous oxide has been found to correct the evil influence of small contaminations by arsenic, antimony, lead, and other foreign metals. Most commercial coppers owe their good qualities to this compensating influence.

Arsenic combines readily with all metals into true arsenides, which latter, in general, are soluble in the metal itself. The presence in a metal of even small proportions of arsenide generally leads to considerable deterioration in mechanical qualities.

Phosphorus.—The remark just made might be said to hold for phosphorus were it not for the existence of what is called "phosphorus-bronze," an alloy of copper with phosphorus (*i.e.*, its own phosphide), which possesses valuable properties. According to Abel, the most favorable effect is produced by from 1 to 1½ per cent. of phosphorus. Such an alloy can be cast like ordinary bronze, but excels the latter in hardness, elasticity, toughness, and tensile strength. (See **PHOSPHORUS**.)

Carbon.—Most metals when in a molten state are capable of dissolving at least small proportions of carbon, which, in general, leads to a deterioration in metallicity, except in the case of iron, which by the addition of small percentages of carbon gains in elasticity and tensile strength with little loss of plasticity (see **IRON**).

Silicon, so far as we know, behaves to metals pretty much like carbon, but our knowledge of facts is limited. What is known as "cast iron" is essentially an alloy of iron proper with 2 to 6 per cent. of carbon and more or less of silicon (see **IRON**). Alloys of copper and silicon were prepared by Deville in 1863. The alloy with 12 per cent. of silicon is white, hard, and brittle. When diluted down to 4.8 per cent., it assumes the color and fusibility of bronze, but, unlike it, is tenacious and ductile like iron.

METAL WORK. Among the many stages in the development of primeval man, none can have been of greater moment in his struggle for existence than the discovery of the metals, and the means of working them. The names generally given to the three prehistoric periods of man's life on the earth—the Stone, the Bronze, and the Iron age—imply the vast importance of the progressive steps from the flint knife to the bronze celt, and lastly to the keen-edged, elastic iron weapon or tool. The length of time during which each of these ages lasted must of course have been different in every country and race in the world. The Digger Indians of South California have even now not progressed beyond the Stone Age; while some of the tribes of Central Africa are acquainted with the use of copper and bronze, though they are unable to smelt or work iron.

The metals chiefly used have been gold, silver, copper and tin (the last two generally mixed, forming an alloy called bronze), iron, and lead. The peculiarities of these various metals have naturally marked out each of them for special uses and methods of treatment. The durability and the extraordinary ductility and pliancy of gold, its power of being subdivided, drawn out, or flattened into wire or leaf of almost infinite fineness, have led to its being used for work where great minuteness and delicacy of execution were required; while its beauty and rarity have, for the most part, limited its use to objects of adornment and luxury, as distinct from those of utility. In a lesser degree most of the qualities of gold are shared by silver, and consequently the treatment of these two metals has always been very similar, though the greater abundance of the latter metal has allowed it to be used on a larger scale and for a greater variety of purposes.

Bronze is an alloy of copper and tin in varying proportions, the proportion of tin being from 8 to 20 per cent. The great fluidity of bronze when melted, the slowness of its contraction on solidifying, together with its density and hardness, make it especially suitable for casting, and allow of its taking the impress of the mold with extreme sharpness and delicacy. In

the form of plate it can be tempered and annealed till its elasticity and toughness are much increased, and it can then be formed into almost any shape under the hammer and punch.

In modern times, after the discovery of zinc, an alloy of copper and zinc called brass has been much used, chiefly for the sake of its cheapness as compared with bronze. In beauty, durability, and delicacy of surface it is very inferior to bronze, and, though of some commercial importance, has been but of little use in the production of works of art.

To some extent copper was used in an almost pure state during mediæval times, especially from the twelfth to the fifteenth century, mainly for objects of ecclesiastical use, such as pyxes, monstrances, reliquaries, and croziers, partly on account of its softness under the tool, and also because it was slightly easier to apply enamel and gilding to pure copper than to bronze. In the mediæval period it was used to some extent in the shape of thin sheeting for roofs, as at St. Mark's, Venice; while during the sixteenth and seventeenth centuries it was largely employed for ornamental domestic vessels of various sorts.

The abundance in which iron is found in so many places, its great strength, its remarkable ductility and malleability in a red-hot state, and the ease with which two heated surfaces of iron can be welded together under the hammer combine to make it specially suitable for works on a large scale where strength with lightness are required—things such as screens, window-grills, ornamental hinges, and the like.

In its hot plastic state iron can be formed and modeled under the hammer to almost any degree of refinement, while its great strength allows it to be beaten out into leaves and ornaments of almost paper-like thinness and delicacy. With repeated hammering, drawing out, and annealing, it gains much in strength and toughness, and the addition of a very minute quantity of carbon converts it into steel, less tough, but of the keenest hardness. The large employment of cast iron is comparatively modern, in England at least only dating from the sixteenth century; it is not, however, incapable of artistic treatment if due regard be paid to the necessities of casting, and if no attempt is made to imitate the fine-drawn lightness to which wrought iron so readily lends itself. At the best, however, it is not generally suited for the finest work, as the great contraction of iron in passing from the fluid to the solid state renders the cast somewhat blunt and spiritless.

Among the Assyrians, Egyptians, and Greeks the use of iron, either cast or wrought, was very limited, bronze being the favorite metal for almost all purposes. The difficulty of smelting the ore was probably one reason for this, as well as the now forgotten skill which enabled bronze to be tempered to a steel-like edge. Gold, silver, and bronze may be treated in various ways, the chief of which are casting in a mold, and treatment by hammering and punching.

METAMORPHOSIS. This term is often employed in several distinct senses in biology. During the early part of the century it was constantly used to include the current morphological conceptions, as, for instance, of the parts of a flower as modified or "metamorphosed" leaves, or of the segments of a skull as modified vertebrae. It is still frequently employed to denote that progressive change from the general to the special undergone by all developing tissues and organs (see BIOLOGY, EMBRYOLOGY), but in this sense is conveniently superseded by the term "differentiation." In the process of animal development, two types are broadly distinguishable—a fetal type, in which development takes place wholly or in greater part either within the egg or within

the body of the parent, and a larval type, in which the young are born in a condition more or less differing from that of the adult, while the adult stage again is reached in one of two ways, either by a process of gradual change, or by a succession of more or less rapid and striking transformations, to which the term metamorphosis is now usually restricted.

METAPHYSIC. The term metaphysic, originally intended to mark the place of a particular treatise in the collection of Aristotle's works, has, mainly owing to a misunderstanding, survived several other titles—such as "First Philosophy," "Ontology," and "Theology," which Aristotle himself used or suggested. Neo-Platonic mystics interpreted it as signifying that which is not merely "after" but "beyond" physics, and found in it a fit designation for a science which, as they held, could not be attained except by one who had turned his back upon the natural world. And writers of a different tendency in a later time gladly accepted it as a convenient nickname for theories which they regarded as having no basis in experience, in the same spirit in which the great German minister Stein used the analogous title of "metapolitics" for airy and impractical schemes of social reform. A brief indication of the contents of Aristotle's treatise may enable us to give a general definition of the science which was first distinctly constituted by it, and to determine in what sense the subjects which that science has to consider are beyond nature and experience.

For Aristotle, metaphysic is the science which has to do with Being as such, Being in general, as distinguished from the special sciences which deal with special forms of being. There are certain questions which, in Aristotle's view, we have a right to ask in regard to everything that presents itself as real. We may ask what is its ideal nature or definition, and what are the conditions of its realization; we may ask by what or whom it was produced, and for what end; we may ask, in other words, for the formal and the material, for the efficient and the final causes of everything that is. These different questions point to different elements in our notion of Being, elements which may be considered in their general relations apart from any particular case of their union. These, therefore, the first philosophy must investigate. But, further, this science of being cannot be entirely separated from the science of knowing, but must determine at least its most general principles. For the science that deals with what is most universal in being is, for that very reason, dealing with the objects which are most nearly akin to the intelligence. These, indeed, are not the objects which are first presented to our minds; we begin with the particular, not the universal; but science reaches its true form only when the order of thought is made one with the order of nature, and the particular is known through the universal. Yet this conversion or revolution of the intellectual point of view is not to be regarded as an absolute change from error to truth; for Aristotle holds that in sense perception there is already the working of that discriminative intelligence which, beginning in sense perception, with the distinction of particular from particular, can rest only when it has apprehended things in their universal forms or definitions. Looking at knowledge *formally*, the highest law of thought, the law of contradiction (or, as we might call it, to indicate Aristotle's meaning more exactly, the law of definition or distinction), is already implied in the first act of perception by which one thing is distinguished from another. Looking at it *materially*, the reason of man is to be conceived as potentially all that is knowable; *i.e.*, objects are so related to it that for it to know them in their essential definitions is only to know itself. The

aim of science, in this view, is to break through the husk of matter, and to apprehend things in their forms, in which they are one with the mind that knows them. Hence also it follows that in rising to the most universal science, the science of Being in general, the mind is not leaving the region of immediate experience, in which it is at home, for a far-off region of abstractions. Rather it is returning to itself, apprehending that which is most closely related to itself, and which, therefore, though it is late in being made the direct object of investigation, is yet presupposed in all that is, and is known.

Metaphysic, then, is the science which deals with the principles which are presupposed in all being and knowing, though they are brought to light only by philosophy. Another trait completes the Aristotelian account of it. It is theology, or the science of God. Now God is pure self-consciousness, the absolute thought which is one with its objects, and He is, therefore, the first cause of all existence. For, while the world of nature is a world of motion and change, in which form is realized in matter, this process of the finite can be explained only by referring it back to an unmoved mover, in whom there is no distinction of matter and form, and who is, therefore, in Aristotle's view, to be conceived as pure form, the purely ideal or theoretic activity of a consciousness whose object is itself. Such a conception, however, while it secures the independence and absoluteness of the unmoved mover, by removing him from all relation to what is other than himself, seems to make his connection with the world inexplicable. We can on this theory refer the world to God, but not God to the world. Hence Aristotle seems sometimes to say that God is the first mover only as He is the last end after which all creation strives, and this leads him to attribute to nature a desire or will which is directed toward the good as its object or end.

Aristotle then brings together in his metaphysic three elements which are often separated from each other, and the connection of which is far from being at once obvious. It is to him the science of the first principles of being. It is also the science of the first principles of knowing. Lastly, it is the science of God, as the beginning and end of all things, the absolute unity of being and thought, in which all differences of finite thought and existence are either excluded or overcome.

To some this description of the contents of Aristotle's treatise, and especially the last part of it, may seem to be a confirmation of all the worst charges brought against metaphysic. For at both extremes this supposed science seems to deal with that which is beyond experience, and which, therefore, cannot be verified by it. It takes us back to a beginning which is prior to the existence as well as to the consciousness of finite objects in time and space, and on to an end to which no scientific prophecy based upon our consciousness of such objects can reach. In the former aspect of it, it has to do with notions so abstract and general that it seems as if they could not be fixed or tested by reference to any experience, but must necessarily be the playthings of dialectical sophistry. In the latter aspect of it, it entangles us in questions as to the final cause and ultimate meaning of things, questions involving so comprehensive a view of the infinite universe in which we are insignificant parts that it seems as if any attempt to answer them must be for us vain and presumptuous. On both sides, therefore, metaphysic appears to be an attempt to occupy regions which are beyond the habitable space of the intelligible world—to deal with ideas which are either so vague and abstract that they cannot be fastened to any definite meaning, or so complex and far-reaching that they can never by any possibility be

verified. For beings like men, fixed within these narrow limits of space and time, the true course, it would seem, is to "cultivate their gardens," asking neither whence they come nor whither they go, or asking it only within the possible limits of history and scientific prophecy. To go back to the beginning or on to the end is beyond them, even in a temporal, still more in a metaphysical, sense. Our state is best pictured by that early Anglican philosopher who compared it to a bird flying through a lighted room "between the night and the night." The true aim of philosophy is, therefore, it would seem, to direct our thoughts to the careful examination and utilization of the narrow space allotted to us by an inscrutable power, and with scientific self-restraint to refrain from all speculation either on first or on final causes.

METAPONTUM, or METAPONTIUM, a city of Magna Græcia, situated on the Gulf of Tarentum, near the mouth of the river Bradanus. It was founded by an Achæan colony about 700 B.C., though various traditions existed which assigned it an earlier origin.

METASTASIO. Pietro Trapassi, the Italian poet, who is better known by his assumed name of Metastasio, was born in Rome, January 6, 1698. Pietro, while quite a child, showed an extraordinary talent for improvisation, and often held a crowd attentive in the streets while he recited impromptu verses on a given subject. Metastasio soon found himself competing with the most celebrated improvisatori of his time in Italy. At the age of twelve, while attending to classical and legal studies, he translated the *Iliad* into octave stanzas; and two years later he composed a tragedy in the manner of Seneca upon a subject chosen from Trissino's *Italia Liberata*. In 1721 he composed an epithalamium, and probably also his first musical serenade, *Endimione*, on the occasion of the marriage of his patroness the Princess Pinelli di Sangro to the Marchese Belmonte Pignatelli. In 1722 the birthday of the empress had to be celebrated with more than ordinary honors, and the viceroy applied to Metastasio to compose a serenata for the occasion. It was arranged that his authorship should be kept a profound secret. Under these conditions Metastasio produced *Gli Orti Esperidi*. Set to music by Porpora, it won the most extraordinary applause.

Metastasio resided with La Romanina and her husband in Rome. Under her influence he wrote in rapid succession the *Didone Abbandonata*, *Catone in Utica*, *Ezio*, *Alessandro nell' Indie*, *Semiramide Riconosciuta*, *Siroe*, and *Artaserse*. These dramas were set to music by the chief composers of the day, and performed in the chief towns of Italy.

In the early summer of 1730, Metastasio settled at Vienna in the house of a Spanish Neapolitan, Niccolò Martinez, where he resided until his death. This date marks a new period in his artistic activity. Between the years 1730 and 1740 his finest dramas, *Adriano*, *Demetrio*, *Issipile*, *Demofonte*, *Olimpiade*, *Clemenza di Tito*, *Achille in Sciro*, *Temistocle*, and *Attilio Regolo*, were produced for the imperial theater. Some of them had to be composed for special occasions, with almost incredible rapidity—the *Achille* in eighteen days, the *Ipermestra* in nine. As time advanced the life which Metastasio led at Vienna, together with the climate, told upon his health and spirits. He sank rapidly into the habits of old age; and, though his life was prolonged till the year 1782, very little can be said about it. On the 12th of April he died.

METCALFE, CHARLES THEOPHILUS METCALFE, BARON, a distinguished administrator, was born at Calcutta, January 30, 1785. He died September 5, 1846.

METELLUS, the name of the most important

family of the Roman plebeian gens Cæcilia. They rose to distinction during the Second Punic War, and Nævius satirized them.

QUINTUS CÆCILIUS METELLUS MACEDONICUS, prætor, 148 B.C., in Macedonia, defeated Andrisus in two battles, and forced him to surrender. He then superintended the conversion of Macedonia into a Roman province. He was a moderate reformer, and was considered the model of a fortunate man; before his death in 115, three of his sons had been consuls, one censor, and the fourth was a candidate for the consulship.

QUINTUS CÆCILIUS METELLUS NUMIDICUS, whose reputation for integrity was such that when he was accused of extortion the jury refused to examine his accounts, was selected to command against Jugurtha in 109 B.C. He subjected the army to rigid discipline, and aimed solely at seizing Jugurtha himself; he defeated the king by the river Muthul, and next year, after a difficult march through the desert, took his stronghold, Thala.

QUINTUS CÆCILIUS METELLUS PIUS, so called from his efforts to restore his father Numidicus, commanded in the Social War, defeating Q. Pompædus, (88 B.C.) Sulla on departing gave him proconsular command over South Italy.

QUINTUS CÆCILIUS METELLUS PIUS SCIPIO, son of Scipio Nasica, was adopted by the preceding. He was accused of bribery in 60 B.C., and defended by Cicero. In August, 52, Pompeius procured him the consulate. In 46 he was defeated at Thapsus; in his flight to Spain he was stopped by a corsair, and stabbed himself.

QUINTUS CÆCILIUS METELLUS CELER, prætor 63 B.C., was sent to cut off Catiline's retreat northward. Consul in 61, his personal influence prevented the holding of the Compitalia, which the senate had forbidden and the tribunes permitted. He opposed the agrarian law of the tribune L. Flavius; and stood firm even though imprisoned; the law had to be given up. He also tried, though fruitlessly, to obstruct Cæsar's agrarian law in 59. He died that year under suspicion of poison given by his wife, Clodia.

METEMPSYCHOSIS, the transmigration of the soul, as an immortal essence, into successive bodily forms, either human or animal. This doctrine, famous in antiquity, and one of the characteristic doctrines of Pythagoras, appears to have originated in Egypt. This indeed is affirmed by Herodotus. Plato, in a well-known passage of the *Phædrus*, adapts, as was his wont, the Pythagorean doctrine to his myth or allegory about the soul of the philosopher. That soul, he says, though it may have suffered a fall in its attempt to contemplate celestial things, still is not condemned, in its first entrance into another form, to any bestial existence, but, according to its attainments, *i. e.*, to the progress which it has made in its aspiration for celestial verities, it passes, in nine distinct grades, into the body of someone destined to become a philosopher, a poet, a king, a general, a seer, etc., or, if very inferior, it will animate a sophist or an autocrat. Plato extends the cycle of existence to 10,000 years, which is subdivided into periods of 1,000 years, after the lapse of which the souls undergo judgment, and are admitted to everlasting happiness or condemned to punishment. It is after the period of 1,000 years, he adds, that the human soul comes into a beast, and from a beast again into a man, if the soul originally was human.

Pythagoras, who was said to have traveled in Egypt, brought this fantastic doctrine into Magna Græcia, and made it a prominent part of his teaching. He declared that he had himself been Euphorbus, the son of Panthus, in the time of the Trojan War, and had successively inhabited other human bodies, the actions of all

which he remembered. Closely connected with his theory of metempsychosis was his strict precept to abstain from animal food, even from eggs, from some kinds of fish, and (for some unknown, probably symbolic, reason) from beans. There can be no doubt that the Egyptian custom of preserving the mummies of cats, crocodiles, and some other creatures had its origin in the notion that they had been inhabited by souls which might some day claim these bodies for their own. We cannot suppose that Plato or the later Greeks really believed in the transmigration of souls, though there are many allusions to it, generally of a somewhat playful character.

METEOR, METEORITE. The term meteor, in accordance with its etymology, meant originally something high in the air. It has been applied to a large variety of phenomena, most of them of brief duration, which have place in the atmosphere. Disturbances in the air are aerial meteors, viz., winds, tornadoes, whirlwinds, typhoons, hurricanes, etc. The vapor of water in the atmosphere creates by its forms and precipitations the aqueous meteors, viz., clouds, fogs, mists, snow, rain, hail, etc. The effect of light upon the atmosphere and its contents causes certain luminous meteors, viz., rainbows, halos, parhelia, twilight, mirage, etc. Discussion of all these, and of like phenomena, belongs to METEOROLOGY, (*q. v.*)

Another class of luminous meteors, known as shooting or falling stars, fireballs, bolides, etc., have their place in the upper parts of the atmosphere. But by reason of their origin from without, they, and the aërolites or meteorites which sometimes come from them, belong properly to astronomy. The term meteor is often used in a restricted sense as meaning one of these latter phenomena. The present article will treat of them alone.

The most remarkable of the meteors (and the most instructive) are those which are followed by the falling of stones to the earth. These have since the beginning of the present century attracted so much attention, and the phenomena have been so frequently examined and described by scientific men, that they are very well understood. The circumstances accompanying the fall of stones are tolerably uniform. A ball of fire crosses the sky so bright as to be visible, if it appears in the daytime, sometimes even at hundreds of miles from the meteor; and if it appears in the night it is bright enough to light up the whole landscape. It traverses the sky, generally finishing its course in a few seconds. It suddenly goes out, either with or without an apparent bursting in pieces, and after a short period a loud detonation is heard in all the region near the place where the meteor has disappeared. Sometimes only a single stone, sometimes several are found. For some falls they are numbered by thousands. About 3,000 were obtained from the fall of L'Aigle in 1803, scattered over a region about seven miles long and of less breadth. From the Emmet county (Iowa) fall, May 10, 1879, a similarly large number have been secured.

These meteors leave behind them in the air a cloud or train that may disappear in a few seconds, or may remain an hour. They come at all times of day, at all seasons of the year, and in all regions of the earth. They come irrespective of the phases of the weather, except as clouds conceal them from view.

On the evening of December 2, 1876, persons in the State of Kansas saw, about eight o'clock in the evening, a bright fireball rising from near where the moon then was in the western sky. It increased in brilliancy as it proceeded, becoming so bright as to compel the attention of everyone who was out of doors. To persons in the northern part of the State the meteor crossed the

southern sky going to the east, to those in the southern part it crossed the northern heavens. To all it went down near to the horizon a little to the north of east, the whole flight as they saw it occupying not over a minute.

The same meteor was seen to pass in nearly the same way across the heavens from west-southwest to east-northeast by inhabitants of the States of Nebraska, Iowa, Missouri, Wisconsin, Illinois, Michigan, Kentucky, Indiana, Ohio, Pennsylvania, and West Virginia. But besides this there were heard near the meteor's path, four or five minutes after its passage, loud explosions like distant cannonading, or thunder, or like the rattling of empty wagons over stony roads. So loud were these that people and animals were frightened. East of the Mississippi river these explosions were heard everywhere within about sixty miles of the meteor's path; and in Bloomington, Ind., sounds were heard supposed to come from the meteor even at a distance of nearly 150 miles from it. Over central Illinois it was seen to break into fragments like a rocket, and over Indiana and Ohio it formed a flock or cluster of meteors computed to be forty miles long and five miles broad. The sky in New York State was wholly overcast. Persons in Ohio and Pennsylvania, who from their situation could look over the cloud last, saw the meteor passing on eastward toward New York. From many places in that State itself came accounts of rattling of houses, thundering noises, and other like phenomena, which at the time were attributed to an earthquake.

At one place in northern Indiana a farmer heard a heavy thud as of an object striking the ground near his house. The next morning he found on the snow a stone of very peculiar appearance weighing three-quarters of a pound, which from its character there is every reason to believe came from the meteor. By putting together the various accounts of observers, the meteor is shown to have become first visible when it was near the northwest corner of the Indian Territory, at an elevation of between 60 and 100 miles above the earth. From here it went nearly parallel to the earth's surface, and nearly in a right line, to a point over central New York. During the latter part of its course its height was thirty or forty miles. It thus traversed the upper regions of the air through 25° of longitude and 5° of latitude in a period of time not easily determined, but probably about two minutes. A part of the body may have passed on out of the atmosphere, but probably the remnants came somewhere to the ground in New York, or farther east.

Next to the stone-producing meteor is the fireball, or bolide, which gives generally a less brilliant light than the former, but in essential appearances is like it. The bolides leave trains of light behind them just as the stone meteors do; they travel with similar velocities both apparent and actual, and in all respects exhibit only such differences of phenomena as would be fully explained by differences in size, cohesion, and chemical constitution of the stones causing them.

Next to the bolide is a smaller meteor which appears as if one of the stars were to leave its place in the heavens, shoot across the sky, and disappear—all within the fraction of a second. Some meteors of this class are as bright as Venus or Jupiter. Some are so small that though you look directly at the meteor, you doubt whether you see one or not. In the telescope still smaller ones are seen that are invisible to the naked eye. Meteors comparable in brightness to the planets and the fixed stars are usually called shooting stars. The first important fact about the meteors is the region in which they become visible to us. In hundreds of in-

stances observations have been made upon the luminous path of a meteor at two or more stations many miles apart. When such stations and the path are properly situated relatively to each other, observations carefully made will show a parallax by which the height of the meteor above the earth, the length and direction of the path, and other like quantities may be computed. The general result from several hundred instances is that the region of meteor paths may be in general regarded as between forty and eighty miles above the earth's surface. Some first appear above eighty miles, and some descend below forty miles. But an altitude greater than 100 miles, or one below twenty-five, except in the case of a stone-furnishing meteor, must be regarded as very doubtful. Thus the meteor paths are far above the usual meteorological phenomena, which (except auroras and twilight) have not one-tenth of the height of the meteors. But with reference to all other astronomical phenomena they are very close to us. The comets, for example, are well-nigh a million-fold, and even the moon is a thousandfold, more distant from us.

In regard to velocities of meteors we may only say in general that the velocities computed from good observations are rarely, if ever, under eight or ten miles a second, or over forty or fifty miles, and that some have far greater velocities than others. The average velocity seems to be nearly thirty miles.

The cause of a meteor is now universally admitted to be something that enters the earth's atmosphere from without, with a velocity relative to the earth that is comparable with the earth's velocity in its orbit, which is nineteen miles per second. By the resistance it meets in penetrating the air the light and other phenomena of the luminous train are produced. Under favorable circumstances, portions of these bodies reach the earth's surface as meteorites.

A body which is traveling in space, and which on coming into the air would under favorable circumstances become a meteor, may be called a meteoroid. The meteoroids are all solid bodies. It would hardly be possible for a small quantity of gas out in space to retain such a density as would enable it on coming into the air to go 10 or 100 miles through even the rare upper atmosphere, and give us the clear line which a shooting star describes. Even if a liquid or gaseous mass can travel as such in space, it would be instantly scattered on striking the air, and would appear very unlike a shooting star or bolide.

Of the larger meteors there are in the mean six or eight per annum which in the last fifty years have furnished stones for our collections. A much larger number have doubtless sent down stones which have never been found. Thus Daubr e estimates for the whole earth an annual number of 600 or 700 stone-falls.

But of the small meteors or shooting stars the number is very much larger. There come into the air not less than 20,000,000 of bodies daily, each of which, under very favorable conditions of absence of sunlight, moonlight, clouds, and mists, would furnish a shooting star visible to the naked eye.

The meteoroids, whatever be their size, must by the law of gravitation have motions about the sun in the same way as the planets and comets, that is, in conic sections of which the sun is always at one focus. The apparent motions of the meteors across the sky imply that these motions of the meteoroids relative to the sun cannot as a rule be in or near the plane of the ecliptic. For if they were there, since the motion of the earth is also in the ecliptic, the motion of the meteoroids relative to the earth would be in the same plane. This would involve that all the meteor paths as seen on the

sky would, if produced backward, cross the ecliptic above the horizon. In fact there is no tendency of this kind. Hence the meteoroids do not move in orbits that are near the ecliptic as the planets do, but like the comets they may and usually do have orbits of considerable inclinations.

While the average number of shooting stars for a single observer at midnight may be regarded as tolerably constant, there have been special epochs when many more have been seen. In certain instances the sky has been filled with the luminous trains, just as it is filled by descending snowflakes in a snowstorm, making a veritable shower of fire. One of the best-observed, though by no means the most brilliant, of these showers occurred on the evening of November 27, 1872. Some of the observers of that shower, counting singly, saw at the rate of 8,000 or 10,000 shooting stars in the course of two hours. The distances of the meteoroids in the middle of the swarm which the earth then passed through, each from its nearer neighbors, would be thirty or forty miles.

On several years after 1833, and before and after 1866-68, there were unusual numbers of those meteors seen on the mornings of November 13th, 14th, and 15th, though perhaps they would have been unnoticed had there not been special watching for them. It will be seen that all these showers are at intervals of a third of a century, that they are at a fixed day of the year, and that the day has moved steadily and uniformly along the calendar at the rate of about a month in a thousand years. The change of twelve days in the seventeenth century is due to the change from old to new style. The only explanation of this periodical display that is now seriously urged, and the one which is universally accepted by astronomers, is that there is a long, thin stream of meteoroids, each of which is traveling about the sun in a conic section. These conic sections are all nearly parallel, and have nearly the same major axis, extending out about as far as the orbit of Uranus, and each requiring the common period of thirty-three and a quarter years. The length of the stream is such that the most advanced members are six or eight years ahead of the hindmost, and they all cross the earth's orbit with a velocity of about twenty-six miles a second. Since the earth plunges through the group in nearly an opposite direction, the velocity with which they enter the air is forty-four miles a second. One of the facts which have greatly aided us in arriving at this explanation is that these meteors in all the years and through all hours of the night cross the sky as we look at them in lines which diverge from a point near the center of the sickle in the constellation Leo; hence the paths in the air are parallel. This implies that their velocities relative to the sun are all parallel and equal to each other. The radiation from Leo has given them the name *Léonids*.

METEORA, a remarkable group of rock-built monasteries in Thessaly, in the northern side of the valley of the Peneus, not quite twenty miles northeast of Triccala, and in the immediate vicinity of the village of Kalabaka, Stagus, or Stagoi (the ancient Æginium). On the summit of these rocky pinnacles—accessible only by the aid of rope and basket let down from the top, or in some cases by a series of almost perpendicular ladders climbing the cliff to the mouth of a tunnel—stand the monasteries of Meteora. At one time they were twenty-four in number. Meteora *par excellence* is the largest and perhaps the most ancient. The present building was erected, according to Leake's reading of the local inscription, in 1388 (Björnstahl, the Swedish traveler, had given 1371), and the church is one of the largest and handsomest in Greece.

METEOROLOGY, in its original and etymological

sense, included within its scope all appearances of the sky, astronomical as well as atmospherical, but the term is now restricted to the description and explanation of the phenomena of the atmosphere which may be conveniently grouped under weather and climate. These phenomena relate to the action of the forces on which the variations of pressure, temperature, humidity, and electricity of the atmosphere depend, but in an especial sense to the aerial movements which necessarily result from these variations.

In the more exact development of meteorology, the scientific investigation of climate long preceded that of weather. Humboldt's work on *Isothermal Lines*, published in 1817, must be regarded as the first great contribution to meteorological science. Dove continued and extended the investigation, and in his great work *On the Distribution of Heat on the Surface of the Globe*, published in 1852, gave charts showing the mean temperature of the world for each month and for the year, together with charts of abnormal temperature. To this, more than to any other work, belongs the merit of having popularized the science of meteorology in the best sense, by enlisting in its service troops of observers in all parts of the civilized world.

In 1868 another series of important charts were published representing by isobaric lines the distribution of the mass of the earth's atmosphere, and by arrows the prevailing winds over the globe for the months and the year. By these charts the movements of the atmosphere and the immediate causes of these movements were for the first time approximately stated, and some knowledge was thereby attained of some of the more difficult problems of meteorology. It was shown that the prevailing winds are the simple result of the relative distribution of the mass of the earth's atmosphere, in other words, of the relative distribution of its pressure, the direction and force of the prevailing winds being simply the flow of the air from a region of higher toward a region of lower pressure, or from where there is a surplus to where there is a deficiency of air. It is on this broad and vital principle that meteorology rests, which is found to be of universal application throughout the science, in explanation, not only of prevailing winds, but of all winds, and of weather and weather changes generally. One of the more important uses of the principle is in its furnishing the key to the climates of the different regions of the earth; for climate is practically determined by the temperature and moisture of the air, and these in their turn are dependent on the prevailing winds, which are charged with the temperature and moisture of the regions they have traversed. The isobaric charts show further that the distribution of the mass of the earth's atmosphere depends on the geographical distribution of land and water in their relation to the sun's heat and the radiation toward the regions of space in different seasons.

In 1882 Loomis published a map showing the mean rainfall of the globe. This map and others that have been constructed for separate countries show conclusively that the rainfall of any region is determined by the prevailing winds considered in relation to regions from which they have come, and the physical configuration and temperature of the part of the earth's surface over which they blow. The maximum rainfall is precipitated by winds which, having traversed a large breadth of ocean, come up against and blow over a mountainous ridge lying across their path, and the amount deposited is still further increased if the winds pass at the same time through regions the temperature of which constantly becomes colder. On the other hand, the rainfall is usually small, or *nil* when the prevailing winds have not previously traversed some extent of

ocean, but have crossed a mountain ridge and advanced at the same time into lower latitudes, or regions the temperature of which is markedly higher.

While the observational data for the determination of the geographical distribution of the prime elements of climate, viz., the pressure, temperature, moisture, and movements of the atmosphere and the rainfall were being slowly but surely collected, the great importance of the study of weather came gradually to be recognized. Additional impetus was given to this branch of study from its intimate bearings on the eminently practical question of storm warnings. Synchronous weather maps, showing the weather over a considerable portion of the earth's surface, were constructed, and some advance was made in tracing the progress of storms from day to day. Unquestionably one of the first problems of meteorology is to ascertain the course storms usually follow and the causes by which that course is determined, so as to deduce from the meteorological phenomena observed, not only the certain approach of a storm, but also the particular course that storm will take. The method of practically conducting this large inquiry in the most effective manner was devised by Leverrier, and begun to be carried out in 1858 by the publication of the *Bulletin International*, to which a weather map was added in September, 1863. This map showed graphically for the morning of the day of publication the atmospheric pressure, and the direction and force of the wind, together with tables of temperature, rainfall, cloud, and sea disturbance from a large number of places in all parts of Europe. From such weather maps forecasts of storms are framed and suitable warnings issued; but above all a body of information in a very handy form is being collected, the careful study and discussion of which is slowly but gradually leading to the issue of more exact and satisfactory forecasts of weather, and to a juster knowledge of these great atmospheric movements which form the groundwork of the science.

An interchange of heat is constantly going on among bodies exposed to each other, whatever be their temperature. This mode by which heat is communicated from one body to another is called radiation. Radiant heat proceeds in straight lines, diverging in all directions from the source, is only in a limited degree influenced by the air through which it passes, and is not diverted from the straight course by the wind. The intensity is proportional to the temperature of the source, and is greater according to the degree of inclination of the surface on which the rays fall.

If, then, a body be placed in the presence of other bodies, some colder and some warmer than itself, it will from this mutual interchange of temperature receive more heat from the warmer bodies than it radiates to them, and consequently becomes warmer; but it will receive less heat from the colder bodies than it radiates to them and its temperature consequently falls. This is precisely the condition in which the earth is placed in space. When a part of the surface is turned toward the sun, that part of the surface receives more heat than is radiated from it; and the temperature consequently rises most in that region which for the time is perpendicular to the sun's rays, and least around the annulus where the inclination of the surface is greatest. On the other hand, since the hemisphere turned from the sun radiates more heat than it receives from the cold region of space, the temperature there falls. Owing to the essentially distinct conditions under which the earth is placed with respect to radiation, the subject falls naturally to be divided into two heads, solar radiation and terrestrial radiation.

Of the sun's rays which arrive at the earth's surface,

those which fall on the land and solid bodies generally are wholly absorbed by the thin surface layer exposed to the heating rays, the temperature of which consequently rises. While the temperature of the surface increases, a wave of heat is propagated downward through the soil. The intensity of the daily wave of temperature rapidly lessens with the depth at a rate depending on the conductivity of the soil, until at about four feet below the surface it ceases to be measurable. Part of the heat of the surface layer is conveyed upward through the air by the convection currents which have their origin in the heating of the lowermost stratum of air in direct contact with the heated surface of the land.

Altogether different is the influence of the sun's rays on water. In this case the sun's heat is not all, indeed very far from all, arrested at the surface, but penetrates to a considerable depth. The depth to which the influence of the sun is felt has been shown by the observations made during the cruise of the *Challenger* to be, roughly speaking, about 500 feet below the surface of the sea. The rate at which, in perfectly clear water, this heat is distributed at different depths is a problem that has not yet been worked out.

In shallow water the sun's heat raises the temperature much higher than that of deep water, this being obvious from the consideration that nearly the whole of the sun's heat which falls on the surface is utilized in raising the temperature of the shallow layer of water; in other words, it is, so to speak, concentrated through a small depth of water instead of being diffused through a great depth.

The times of occurrence of the highest, lowest, and mean daily temperatures, and the amount of the daily range of temperature, are in a great degree influenced by the covering or want of covering of the earth's surface on which the air rests. When the ground is covered with vegetation, the whole of the solar heat falls on the vegetable covering; and, as none falls immediately on the soil, its temperature does not rise so high as happens where there is no vegetable covering to shade the surface from the sun. The temperature of plants exposed to the sun is not so high as that of exposed soil in the vicinity. As regards forests, the four diurnal phases of temperature occur later than in the open country, and the maximum and minimum are less decided; and, since the maximum temperature of the air in forests falls short of the maximum in the open to a considerably greater extent than the minimum under trees is above the minimum in the open, it follows that the mean temperature of the air in forests is less than that of the open country adjoining. The reason of the difference is that the chilling effects of nocturnal radiation penetrate lower down among the trees than do the heating effects of solar radiation; and as the soil is not heated directly by the sun its temperature is lower, and consequently that of the air over it is also lower. A cleared space in a forest, sheltered by the surrounding trees, but open to the sun, has a warmer and moister atmosphere in spring and summer and very much moister in autumn than prevails in the open country adjoining, and has also the diurnal differences of range peculiar to a warmer and moister atmosphere.

One of the most important elements of climate is disclosed by the difference between the hour of lowest and the hour of highest mean temperature respectively, or, as it is usually expressed, by the daily range of temperature. In the same part of the Atlantic the daily range of the temperature of the air resting on the ocean is 3.2° , and on the sea near land 4.4° . On advancing on the land, the daily range of temperature rapidly increases, and the rate of increase is greatly augmented when an inland position is arrived at to which any sea breezes that may prevail do not extend.

The true daily range of temperature is stated by observations made with maximum and minimum thermometers. Generally speaking, the amount of the range increases as the latitude is diminished, and as the distance from the sea is increased, but above all it increases in proportion to the dryness of the climate.

The gaseous envelope surrounding the earth is composed of two atmospheres, quite distinct from each other—an atmosphere of dry air and an atmosphere of aqueous vapor. The dry air, which consists of oxygen and nitrogen, is always a gas, and its quantity remains constant; but the aqueous vapor does not continue permanently in the gaseous state, and the quantity present in the air is, by the ceaseless processes of evaporation and condensation, constantly changing. If the aqueous vapor remained permanently and unchanged in the atmosphere, or were not liable to be condensed into cloud or rain, the mixture would become as complete as that of the oxygen and nitrogen of the air. The equilibrium of the vapor atmosphere, however, is being constantly disturbed by every change of temperature, by every instance of condensation, and by the unceasing process of evaporation. Since dry air further materially obstructs the free diffusion of the aqueous vapor, it follows that the law of the independent pressure of the vapor and of the dry air of the atmosphere holds good only approximately. The aqueous vapor, however, constantly tends to approach this state. Since, then, the independent and equal diffusion of the dry air and the aqueous vapor is, owing to these disturbing causes, never reached, the important conclusion follows that the hygrometer can never indicate more than the local humidity of the place where it is observed. Hygrometric observations can therefore be regarded only as approximations to a true indication of the quantity of aqueous vapor in the atmosphere over the place of observation. It is, however, to be added that, while in certain cases the amount of vapor indicated is far from the truth, yet in averages, particularly long averages, a close approximation to the real amount is reached if the hygrometer be at all tolerably well exposed and carefully observed.

Aqueous vapor is constantly being added to the air from the surfaces of water, snow, and ice, from moist surfaces, and from plants. The rate of evaporation increases with an increase of temperature, because the capacity of the air for vapor is thereby increased. The atmosphere can contain only a certain definite amount of vapor, according to the temperature; when, therefore, the air has its full complement of vapor, or when, in other words, it is saturated, evaporation ceases. Thus the rate of evaporation is greatest when the air is driest or freest from vapor, and least when the air is nearest the point of saturation. Since currents of air remove the moisture and substitute drier air over the evaporating surfaces, evaporation is much more rapid during wind than in calm weather. As air expands under a diminished pressure, its temperature consequently falls, and it continues to approach nearer to the point of saturation, or becomes moister; and, as it contracts under an increased pressure, its temperature rises and it recedes from the point of saturation or becomes drier. Hence ascending currents of air become moister with every addition to the ascent, and descending currents drier as they continue to descend. Thus as winds ascend the slopes of hills they become moister, but when they have crossed the summit and flow down the other side they become drier in proportion to the descent, and all the changes may be experienced from extreme dryness to saturation in the same mass of air, which all the time has practically had its amount of aqueous vapor neither added to nor diminished.

In an atmosphere of air and aqueous vapor perfectly mixed, the elastic force of each at the surface of the earth is the pressure of each. In this case the elastic force of aqueous vapor would be the pressure of the whole vapor in the atmosphere over the place of observation. This pressure is expressed in inches of mercury of the barometer. If we suppose the total barometric pressure to be 30 inches, and the elastic force of vapor to be 0.745 inch, the pressure or weight of the dry air, or air proper, would be 29.255 inches, and of the aqueous vapor 0.745 inch. From this it follows that the elastic force of vapor may be regarded as indicating the quantity of aqueous vapor in the air at the place of observation, or it may be designated the absolute humidity of the air.

The diurnal variation in the elastic force of vapor in the air is seen in its simplest form on the open sea. The disturbance induced by proximity to land in the distribution of the aqueous vapor in the lower strata of the atmosphere is very striking. The maximum and minimum no longer follow the corresponding phases of the temperature of the surface of the sea and of the air. The disturbing agents are the sea and land breezes and their effects. Under the influence of the land breeze the time of the minimum humidity is delayed till about 6 A.M.; and under the influence of the sea breeze and its effects the amount of the aqueous vapor shows a secondary minimum from noon to 2 P.M. It is to be here noted that this midday minimum occurs at the hours of the day when the surface of the land is most highly heated, the ascending current of heated air rising from it therefore strongest, and the resulting breeze from the sea toward the land also strongest.

Next to the winds, the aqueous vapor of the atmosphere, in the diverse ways in which in different localities it is distributed through the hours of the day, plays the most important part in giving to the different parts of the globe its infinitely diversified climates.

Dew is deposited over the earth's surface on comparatively clear and calm nights. As the cooling by terrestrial radiation continues, the temperature of objects on the surface is gradually lowered to the dew-point, and when this point is reached the aqueous vapor begins to be condensed into dew on their surfaces. The quantity deposited is in proportion to the degree of cold produced and the quantity of vapor in the air. Dew is not deposited in cloudy weather, because clouds obstruct the escape of heat by radiation, nor in windy weather, because wind continually renews the air in contact with the surface, thus preventing the temperature from falling sufficiently low. When the temperature is below 32°, dew freezes as it is deposited, and *hoar-frost* is produced. The dew-point practically determines the minimum temperature of the night—because if the temperature falls a little below the dew-point the liberation of heat as the vapor is condensed into dew speedily raises it, and if it rises higher the loss of heat by radiation speedily lowers it. This consideration suggests an important practical use of the hygrometer, it being evident that by ascertaining the dew-point the approach of frost or low temperature likely to injure vegetation may be foreseen and provided against.

The forms of clouds are endless. Since clouds are subject to certain distinct modifications from the same causes which produce other atmospheric phenomena, the face of the sky may be regarded as indicating the operation of these causes, just as the face of man indicates his mental and physical states. Hence the importance of the study of clouds, and hence the necessity of a nomenclature of clouds as the basis of accurate and comparable observations. An adequate nomenclature

of clouds is still a desideratum. Luke Howard's classification, which continues to hold its ground as a provisional nomenclature, was proposed by him in 1803, and by it clouds are considered as divided into seven kinds. Of these, three are simple forms, the *cirrus*, the *cumulus*, and the *stratus*; and four intermediate or compound, the *cirro-cumulus*, the *cirro-stratus*, the *cumulo-stratus*, and the *cumulo-cirro-stratus*, *nimbus*, or *rain-cloud*.

The *cirrus* cloud consists of wavy, parallel, or divergent filaments, which may increase in any or all directions. It is the cloud of the least density, the greatest elevation, and the greatest variety of figure. It is probable that the particles composing it are minute crystals of ice or snowflakes. The *cirrus* is intimately connected with the great movements of the atmosphere; and it is solely from the movements of the *cirrus* that we have any direct knowledge of the upper currents of the atmosphere. In recent years much has been done, particularly by Professor Hildebrandsson of Upsala and Clement Ley, in investigating the relations of this cloud to storms and other changes of weather.

The *cumulus* is the name applied to those convex or conical heaps of clouds which increase upward from a horizontal base. They are generally of a very dense structure, are formed in the lower regions of the atmosphere, and are carried along by the aerial current next the earth. They form the tops of the ascending currents which rise from the heated ground, and have a diurnal period so well marked that they are often named the "cloud of the day." The forms of *stratus* comprehends those mists and fogs which in the calm evening of a warm summer day make their appearance in the bottom of valleys and over low-lying grounds, and sometimes spread upward over the surrounding country like an inundation; they have an equally well marked daily period, and are frequently called the "cloud of night." The *cirro-cumulus* is made up of small roundish masses, lying near each other, and quite separated by intervals of sky. It may be considered as formed from the *cirrus* by the fibers of the cloud breaking, as it were, and collapsing into roundish masses, thus destroying the texture but retaining the arrangement of that cloud. This singularly beautiful cloud is commonly known as a mackerelsky, and is of most frequent occurrence during dry, warm summer weather. The *cirro-stratus* consists of horizontal masses thinned toward the circumference, bent downward or undulating, and either separate or in groups. Since this cloud has great extent and continuity of substance, but little perpendicular depth or thickness, it is the cloud which most frequently fulfills the conditions for the phenomena of coronæ, solar and lunar halos, parhelia or mock suns, and parasenæ or mock moons. The *cumulo-stratus* is formed by the *cirro-stratus* blending with the *cumulus*, or spreading underneath it as a horizontal layer of vapor. The *cumulo-cirro-stratus*, or *nimbus*, is the well-known rain-cloud, which consists of a cloud or system of clouds from which rain is falling. At a considerable height a sheet of *cirro-stratus* cloud is extended, under which *cumulus* clouds drift from windward; these, rapidly increasing, unite and appear to form one continuous gray mass from which the rain falls. The breaking up of the lower gray mass indicates that the rain will soon cease. When a rain-cloud is seen at a distance, *cirri* appear to shoot out from its top in all directions; and it is observed that the more copious the rainfall the greater is the display of *cirri*. The *cirrus*, *cirro-cumulus*, *cirro-stratus*, *cumulo-stratus*, and *nimbus* are connected more or less closely with the great atmospheric movements of the cyclone and anticyclone.

Atmospheric vapor and ascending currents thus play an important part in the history of these thunderstorms. Where the climate is dry and rainless, thunder is altogether unknown. On the other hand, where during a particular season an anticyclone with its vast descending current in the center remains over a region, as happens over the center of the old continent during the winter, over that region thunder is equally unknown during that season. Further, in places where the summer rainfall is small and its occurrence infrequent, thunderstorms become less frequent, and the hours of their occurrence are later in the day than they are before and after the dry season.

Given an initial difference of electric potential, it is easy to understand from the effects which follow the sudden extraordinary condensations of the aqueous vapor that take place how the most violent thunderstorms are produced. The difficulty is to account for the production of the initial difference of electric potential.

Whirlwinds, waterspouts, dust-storms, and tornadoes are essentially the same, differing from each other only in their dimensions, their intensity, or the degree in which the moisture is condensed into visible vapor, while the hailstorm and the rainstorm are simply the manner and degree of the precipitation accompanying them. In several important respects they differ widely and radically from cyclones. The largest tornadoes are of so decidedly smaller dimensions when compared with the smallest cyclones as to admit of no shading of the one into the other. Cyclones occur at all hours of the day and night, whereas whirlwinds and tornadoes show a diurnal period as distinctly marked as any in meteorology. Finally, cyclones take place under conditions which involve unequal atmospheric pressures or densities at the same heights of the atmosphere due to inequalities in the geographical distribution of temperature and humidity; but whirlwinds occur where for the time the air is unusually warm or moist, and where consequently temperature and humidity diminish with height at an abnormally rapid rate. Cyclones are thus phenomena resulting from a disturbance of the equilibrium of the atmosphere considered horizontally, but whirlwinds and tornadoes have their origin in a vertical disturbance of atmospheric equilibrium.

Among the most remarkable of the tornado-swept regions of the globe are certain portions of the United States; and to the examination of these the meteorological service has given special attention by a systematic, careful, and minute observation of the attendant phenomena and the destructive effects. The tornadoes of the last eighty-seven years, numbering about 600, have been classed under the different States where they are reported to have occurred. The atmospheric conditions which appear invariably to precede the formation of the tornado are violent contrasts of temperature and humidity immediately to the north and south of the path to be traversed by the storm. It is highly interesting to observe that the region of most frequent occurrence of tornadoes is the region where a large number of the cyclones of the United States appear to originate (and the same region Loomis has shown to be remarkable for violent contrasts of temperature occurring within limited spaces and times), and that, as appears in the regions of the Alleghanies, they decrease in frequency with height.

The wind of the tornado reaches a velocity probably never equaled in cyclones. During the Ohio tornado of February 4, 1842, large buildings were lifted entire from their foundations, carried several rods through the air, and then dashed to pieces, some of the fragments being carried distances of seven and eight miles; and

large oaks nearly seven feet in girth were snapped across like reeds. This tornado swept on its course at the rate of thirty-four miles an hour, and at one place did its fearful work in the brief space of a minute. The tornado which passed over Mount Carmel (Illinois), June 4, 1877, swept off the spire, vane, and gilded ball of the Methodist church, and carried it bodily fifteen miles to northeastward. The velocity of the ascending currents which kept this heavy object suspended in the air for fifteen or twenty miles must have been very great.

Of the tornadoes the progressive courses of which were recorded, 310 advanced toward northeast, 38 toward southeast, 16 toward east-northeast, 14 toward east, 7 toward north-northeast, 5 toward east-southeast, and 3 toward south-southeast. The course is thus always toward some easterly direction, the great majority being toward the northeast. The velocity of their onward movement varied from 12 to 60 miles an hour, the average being 30 miles an hour. The time occupied in passing a particular spot varied from ten seconds to half an hour, the mean time being nearly six minutes and a half. The width of the path of destruction marked with debris and other relics of the violence of the tornado varied from 40 to 10,000 feet, the average being 362 yards. The direction of the whirling movement of the tornado was invariably from right to left, or the opposite of the movement of the hands of a watch, resembling in this respect the vorticeous movement of cyclones in the northern hemisphere. The passage of the tornado cloud is often described as accompanied with remarkable noises, which observers variously characterize as terrible, deafening, a terrific crash, the roar of a thousand trains of cars, or the uproarious din of innumerable pieces of machinery.

The usual position of the gyrating columns of cloud is vertical; but occasionally a curving form or slanting direction is assumed. It is probable that to these latter forms many stationary or slowly-moving dangerous squalls are to be referred, which spring up with unexpected suddenness in lakes and arms of the sea in mountainous regions.

The dust-storm of India, Arabia, and Africa is a well-marked type of the whirlwind. Previous to the outbreak of a dust-storm the air is unusually calm and sultry, just as happens in the case of the tornado. The simplest form of the dust-storm is that of a tall aerial column of sand moving onward, and drawing into itself, as it whirls around in its course, dust and other light bodies within the sweep of the strong air-currents which blow along the surface of the ground and converge vorticeously around the base of the column.

The high mean pressure in the summer in the Atlantic between Africa and the United States has with its system of winds the most decided influence in bringing about the abnormal distribution of the temperature of that and adjoining regions. Since on its west side the prevailing winds are necessarily southerly, the temperature of that region is abnormally raised, and, on the other hand, since on its east side the winds are northerly, the temperature of the region is abnormally depressed. The result of these two opposite winds is seen in the slanting direction of the isothermal of 80° across the Atlantic, which slanting direction is continued far into the interior of North America for the reasons already stated.

These important bearings of cyclonic and anticyclonic areas on temperature and climate may be thus summarized. The temperature is abnormally raised on the east side of cyclonic areas, and abnormally depressed on the west sides; but, on the other hand, temperature is abnormally raised on the west sides of

anticyclonic areas and depressed on the east sides. In the southern hemisphere these directions are reversed.

Another set of influences, powerfully affecting the temperature, come into play where the surface of the land rises above the sea into elevated plateaus, lofty peaks, or mountain ranges. Thus it has been observed on mountains that the wind during the day in summer exhibits an ascensional tendency due to the circumstance that the temperature of the surface of the mountain is heated in a much greater degree than the air strata at the same levels all around it. An ascensional current consequently rises from the mountain, which is maintained at a steadily stronger rate than at lower levels, because the drain from the updraught is easily supplied from the free surrounding atmosphere. It is the strong insolation at high elevations in the summer months which explains the excessively high day-temperatures encountered in the Rocky Mountains; and from the same conditions, viz., the rarity and purity of the atmosphere, by which terrestrial radiation is but little checked, comes the low temperatures of the nights of those climates in the same season. From this cause it follows that the elevated lands in the interior of continents tend to reduce mean atmospheric pressure in summer to a greater extent than would otherwise be the case. In winter, on the other hand, the temperature of elevated regions in the interior of continents is very much colder than that of the surrounding atmosphere at the same heights, because in such regions the air is exceedingly dry and rare, and consequently radiation to the cold regions of space but little checked. Hence down the slopes of these high lands there are poured in all directions descending currents of very cold air, which intensify the rigors of the winters experienced on the low lands round their base, where accordingly the lowest mean winter temperatures occur. These elevated lands thus materially add to the high atmospheric pressure of the interior of continents during the cold months of the year.

But it is ocean streams and ocean currents which produce the greatest abnormalities in the distribution of the temperature of the air, and it is in the North Atlantic that this cause is most strikingly seen. The increase thus accruing to the winter temperature is greatest about the north of Norway. It is also very great in the British Islands; thus, if no more heat were received than is due to their position on the globe in respect of latitude, the mean winter temperature of Shetland would be 3° and that of London 17°. But mainly owing to the heat given out by the Gulf Stream and other warm currents of the Atlantic their mean winter temperatures are respectively about 39.5° and 39°, Shetland being thus benefited 36.5° and London 22°. The chart of the winter temperature of the British Islands well illustrates the influence of the surrounding ocean in maintaining a higher temperature. It will be seen that the southwest of Ireland is 7° warmer than the east coast of England in the same latitudes. The strong drift current from near Behring's Strait southward along the coast of America has a powerful influence, particularly in lowering the summer temperature of that coast—thus bringing about, in conjunction with the dry, rainless climate of the interior, what are perhaps the most violently contrasted climates, within narrow limits, as regards their temperature. The deflections of the isothermals near the Baltic, Mediterranean, Black, and Caspian Seas, and the fresh-water lakes of America, all point to the disturbing influence of these sheets of water on the temperature.

The height and direction of mountain ranges is an important element in determining climate. If the ranges are perpendicular to the prevailing winds and of a considerable height, they drain the winds of much of their

moisture, thus causing to places to leeward colder winters and hotter summers, by partially removing their protecting screen of vapor, and exposing them more completely to solar and terrestrial radiation.

Rainfall.—Whatever tends to lower the temperature of the air below the dew-point is a cause of rain. It is therefore to the winds we must chiefly look for an explanation of the rainfall, and the broad principles of the connection may be stated to be these five:—(1) when the winds have previously traversed a considerable extent of ocean, the rainfall is moderately large; (2) if the winds advance at the same time into colder regions, the rainfall is largely increased, because the temperature is sooner reduced below the point of saturation; (3) if the winds, though arriving from the ocean, have not traversed a considerable extent of it, the rainfall is not large; (4) if the winds, even though having traversed a large extent of ocean, yet on arriving at the land proceed into lower latitudes or regions markedly warmer, the rainfall is small or nil; (5) if a range of mountains lies across the onward path of the winds, the rainfall is largely increased on the side facing the winds, and reduced over the region on the other side of the range. The reason here is that the air on the windward side of the ridge being suddenly raised to a greater height in crossing the range, the temperature is further reduced by mere expansion, and a more copious precipitation is the result; whereas on the leeward side as the air descends to lower levels it becomes gradually drier, and accordingly the rainfall rapidly diminishes with the descent.

West of the Rocky Mountains the rainfall is very unequally distributed, the annual amounts varying from eighty-six inches at Astoria, near the mouth of the Columbia river, to eight inches at San Diego on the coast, and three inches at the head of the Gulf of California. Over the whole of the region between the Cascade and Rocky Mountains the rainfall at all seasons is extremely small, this being indeed the feature in the climate to which the formation of the cañons of that region is chiefly to be referred. On the other hand, in the United States and Canada to east of longitude 100° W., the distinguishing feature of the rainfall is the comparative equableness of its distribution, an annual rainfall exceeding fifty inches occurring only over restricted districts, and a rainfall as low as twenty inches being scarcely met with anywhere. The regions where the rainfall exceeds fifty inches are Florida, the lower basin of the Mississippi, and the Atlantic seaboard of Nova Scotia and Newfoundland.

In January the annual maximum rainfall occurs over the whole of the west coast from Sitka to lower California; but in the interior between longitude 120° and 95° W., the amount is everywhere small, and over a considerable part in the southwest of this region no rain falls. The region of largest rainfall extends from Louisiana to West Virginia, where the mean varies from four to six inches. Over nearly the whole of the Dominion of Canada, by much the greater part of the winter precipitation is in the form of snow, which has been carefully measured and recorded by the Meteorological Service. The average snowfall for January exceeds thirty inches at St. John's, Newfoundland, in Anticosti, Prince Edward Island, and in many other regions.

In July the rainfall is everywhere small in the west, a large part of this extensive region being absolutely rainless. The remarkable dryness of the climate at this season is due to the northwest winds that set in toward the low pressure of the interior, which thus blow toward warmer regions. The rainfall to the east of the Rocky Mountains is distributed by the winds which are con-

nected with the low-pressure region of the interior and with the high-pressure region of the Atlantic. The result is two regions of larger rainfall—the one in the southeast of the States and the other to the west of the lakes. The summer winds of the southeastern coasts are southerly, and as they are anticyclonic in their origin and have in their course traversed some extent of ocean, they arrive well, but not super-saturated, and pour down a rainfall in July of six inches and upward along the coasts and for some distance inland from Louisiana to Chesapeake Bay. Further, since in July these winds attain their maximum force and persistency, the rainfall at the same time reaches the maximum along the whole coast from Boston to some distance west of New Orleans. Since the summer winds blow in the line of the Alleghany mountains and not across them, the rainfall diminishes in ascending their slopes. The comparative equableness of the rainfall over the eastern States is the necessary result of the winds' passing into higher latitudes, and, therefore, cooler regions. A broad region where the rainfall is less than on each side of it, extends from Michigan to the southwest as far as Canadian River. To the west of the lakes the rainfall rises above four inches, and, since over this region the winds become somewhat easterly as they flow toward the low-pressure area, it is probable that the larger rainfall of this prairie region has its origin in no small degree in the evaporation of the lakes. On ascending the higher reaches of the Mississippi, the amount diminishes, but scarcely falls lower than two inches, being thus analogous to the summer rains of the Upper Ganges. On crossing the water-parting into the basin which drains into Hudson's Bay, we encounter east and northeast winds laden with vapor licked up in their passage over Hudson's Bay, which they distribute in a generous rainfall of probably three to five inches over the rising colonies of Manitoba and Saskatchewan. An important point in the climate of the States is that over nearly the whole of the extensive region stretching between the Alleghanies and Rocky Mountains, except the south coast already referred to, the annual maximum rainfall does not occur in summer, but in spring, the month of largest rainfall in the great majority of cases being May. In the basin of Hudson's Bay July is the month of largest rainfall.

Snow takes the place of rain when the temperature is sufficiently low to freeze the condensed moisture in the atmosphere. Snow is composed of crystals, either six-pointed stars or hexagonal plates, which exhibit the greatest variety of beautiful forms, one thousand different kinds having been observed. These numerous forms Scoresby reduced to five principal varieties: (1) thin plates, comprising several hundred forms of the most exquisite beauty; (2) a nucleus or plane figure, studded with needle-shaped crystals; (3) six-sided, more rarely three-sided, crystals; (4) pyramids of six sides; (5) prismatic crystals, having at the ends and middle thin plates perpendicular to their length. In the same snowfall the forms of the crystals are generally similar. The flakes vary from 0.07 inch to an inch in diameter, the smallest occurring with low temperatures and the largest when the temperature approaches 32° . If the temperature is a little higher, the snow-flakes are partially thawed in falling through it, and fall as sleet. The white color of snow is caused by the combination of the different prismatic colors of the minute snow-crystals. The density of snow is far from uniform; it is generally from ten to twelve times lighter than an equal bulk of water, but varies from eight to sixteen times lighter than water.

The limit of the fall of snow near sea-level coincides roughly with the winter isothermal of 52° , since in

places where the mean winter temperature is no higher than 52° that of the air falls occasionally to 32° or lower during the winter months. As regards Europe, the southern limit is about Gibraltar; in North America it is Savannah, New Orleans, the mouth of the Rio Grande, the head of the Gulf of California, and San Francisco.

The snow-line marks the height below which all the snow that falls annually melts during summer. No general rule can be stated for this height in different climates, owing to the many causes determining it. These are the exposure of mountain slope to the sun (and hence, other things being the same, it is higher on the south than on the north sides of mountains), exposure to the rain-bringing winds, the steepness of the mountains, and the degree of dryness of the air. Hence the position of the snow-line can be known by observation only. It falls only little on either side of the equator to latitude 20° ; from latitude 20° to 70° it falls equally, but from latitude 70° to 78° much more rapidly. To this general rule there are many exceptions. It is 4,000 feet higher on the north than the south side of the Himalayas, owing to the larger snowfall on the south, and the greater dryness of the climate of the north side, and therefore the greater evaporation from the snow there. It is higher in the interior of continents than near the coasts, because the precipitation is less and summer heat greater. In the Caucasus it is 11,063 feet high, but only 8,950 in the Pyrenees. In South America it rises from the equator to latitude 18° , and more on the west than on the east slopes of the Cordilleras, owing to the large precipitation on the east and small precipitation and arid climate of the west side of that chain of mountains. It is as high in latitude 33° south as in 19° north, but south of that latitude it rapidly sinks owing to the heavy rains brought by the moist northwest winds of these regions. In the south of Chili it is 3,000 feet lower than in the same latitudes in Europe, and 6,000 feet lower than in the extremely arid climates of the Rocky Mountains.

METHODISM. I. WESLEYAN METHODISM.—The history of Wesleyan Methodism embraces—(1) the Methodism of Oxford, which was strictly Anglican and rigidly rubrical, though it was also more than rubrical; (2) the evangelical Methodism of the Wesleys after their conversion (in 1738), of which the Wesleyan doctrines of conversion and sanctification were the manifesto and inspiration, while preaching and the class-meeting were the great motive and organizing forces—a movement which before Wesley's death had developed into a form containing, at least in embryo, all the elements of a distinct church organization, although in its general designation and deliberate claims it purported to be only an unattached spiritual society; and (3) Wesleyan Methodism since the death of Wesley, which, by steps at first rapid and afterward, though leisurely, distinct and consecutive, assumed an independent position, and has grown into complete development as a church.

Oxford Methodism began in November, 1729, when John Wesley, returning to Oxford from Lincolnshire, where he had been serving his father as curate, found that his brother Charles, then at Christ Church, had induced a few other students to join him in observing weekly communion. John Wesley's accession lent weight and character to the infant association. Their first bond of association, besides the weekly communion, was the common study of the Greek Testament, with which they joined regular fasting, the observance of stated hours for private devotion, the visitation of the sick, of the poor, and of prisoners, and the instruction of neglected children. They never themselves adopted any common designation, but of the variety of derivative

names they received from outsiders that of "Methodists" prevailed—a sobriquet the fitness of which, indeed, as descriptive of one unchanging and inseparable feature of Wesley's character (which he impressed also on his followers), was undeniable.

This first Oxford Methodism was very churchly. Between 1733 and 1735, however, a new phase was developed. Its adherents became increasingly patristic in their sympathies and tendencies, and Wesley came much under the influence of William Law.

It was in 1736, during his residence in Georgia, whither he had gone as a missionary of the Propagation Society, that he learnt those lessons. When he returned to England he had already accepted the doctrine of "salvation by faith," although he had not as yet learned that view of the nature of faith which he was afterward to teach for half a century. He had, however, as in the journal of his homeward voyage he tells us, learned, "in the ends of the earth," that he "who went to America to convert others was never himself converted to God." In this result his Oxford Methodism came to an end.

2. Methodism after Wesley's Conversion.—John Wesley landed at Deal, on his return from Georgia, on February 1, 1738. His journals on the homeward voyage, says Miss Wedgwood, "chronicle for us that deep dissatisfaction which is felt whenever an earnest nature wakes up to the incompleteness of a traditional religion; and his after life, compared with his two years in Georgia, makes it evident that he passed at this time into a new spiritual region." * * * "By Peter Böhler, in the hands of the great God," he writes in his journal, "I was, on March 5th, fully convinced of the want of that faith whereby we are saved." This "conviction" was followed on March 24th of the same year (1738) by his "conversion."

Like most good men of that age in England, Wesley, before he came under the influence of his Moravian teacher, had regarded faith as a union of intellectual belief and of voluntary self-submission—the belief of the creeds and submission to the laws of Christ and to the rules and services of the church, acted out day by day and hour by hour, in all the prescribed means and services of the church and in the general duties of life. From this conception of faith the element of the supernatural was wanting, and equally that of personal trust for salvation on the atonement of Christ. The work of Böhler was to convince Wesley that such faith as this, even though there might be more or less of divine influence unconsciously mingling with its attainment and exercise, was essentially nothing else than an intellectual and moral act or habit, a natural operation and result altogether different from the true spiritual faith of a Christian. This conviction led him a few days afterward to stand up at the house of the Rev. Mr. Hutton, College street, Westminster, and declare that five days before he had not been a Christian. When warned not thus to despise the benefits of sacramental grace, he rejoined, "When we renounce everything but faith and get into Christ, then, and not till then, have we reason to believe that we are Christians." It is true that for several years after this he remained High-Church in some of his principles and opinions, but nevertheless his ritualism was dead at the roots.

This experience also made Wesley an evangelist. He had a forgotten gospel to preach—the gospel by which men were to be converted, as he had been, and to be made "new creatures." And this result, this new birth, was not dependent on any churchly form or ordinance, on any priestly prerogative or service, or on any sacramental grace or influence. To raise up, accordingly, by his preaching and personal influence, a

body of converted men, who should themselves become witnesses of the same truth by which he had been saved, was henceforth to be Wesley's life-work. This was the inspiration under which he became a great preacher; this also made him an organizer of his living witnesses into classes and societies. In the pulpit was the preaching power; in the class-room was the private and personal influence. The vital link between the pulpit and the class meeting was the doctrine and experience of "conversion." Thus Wesleyan Methodism is derived, not from Wesley the ritualist, but from Wesley the evangelist.

Wesley's doctrines offended the clergy. His popularity as a preacher alarmed them. The churches were soon shut against him. He attended the religious meetings—on a Church of England basis—which had existed in London and elsewhere for fifty years, so far as these were still open to him, the Moravian meetings, and meetings in the rooms of private friends, but these were quite insufficient for the zeal and energy of himself and his brother, who had been "converted" a few days before himself. Accordingly, in 1739, he followed the example set by Whitefield, and preached in the open air to immense crowds. In the same year also he yielded to the urgency of his followers and to the pressure of circumstances, and, becoming possessed of an old building called "the Foundry," in Moorfields, transformed it into a meeting-house. Here large congregations came together to hear the brothers.

The religious societies through which the Wesleys, after their conversion, exercised at first their spiritual influence were in part, as has been intimated, Moravian—that in Fetter Lane, of which the rules were drawn up by Wesley himself in 1738 (May 1), being the chief of these—and in part societies in connection with the Church of England, the successors of those which sprang up in the last years of the Stuarts, as if to compensate for the decay of Puritanism within the church. In 1739, however, a strong leaven of antinomian quietism gained entrance among the Moravians of England (Böhler himself having left for America in the spring of 1738); and Wesley, after vainly contending for a time against this corruption, found it necessary formally to separate from them, and to establish a society of his own, for which a place of meeting was already provided at the Foundry. This was the first society under the direct control of Wesley, and herein was the actual and vital beginning of the Wesleyan Methodist Society, that is, of Wesleyan Methodism. Hence the Wesleys celebrated their centenary in 1839. It was not, however, till 1743 that Wesley published the rules of his society.

Wesley called his society, when he published the "Rules" in 1743, the "United Societies." His brother's name was joined with his own at the foot of these rules, in their second edition, dated May 1, 1743, and so remained in all later editions while Charles Wesley lived. Those rules are still the rules of Wesleyan Methodism. Since Wesley's death they have not been altered. During his life only one change was made of any importance. In 1743 the offerings given weekly in the classes were for the poor, there being at that time no Conference and no itinerant preachers except the two brothers; after a few years the rules prescribed that the weekly contributions were to go "toward the support of the gospel."

In 1739 these societies were not divided into "classes." But in 1742 this further step in organization was taken, and the change is recognized in the rules of 1743. Leaders were appointed to these classes, and became an order of spiritual helpers and subpastors, not ordained like lay elders in the Presbyterian churches, but, like

them, filling up the interval between the pastors that "labor in the word and doctrine" and the members generally. What would to-day be called the "unsectarian" character of his society was, indeed, in Wesley's view, one of its chief glories. All the time, however, this "unsectarian" society was only another "sect" in process of formation. Wesley for many years before his death had seen that, unless the rulers of the church should come to adopt in regard to his society a policy of liberal recognition, this might be the outcome of his life-work. And it would seem as if in his private confidences with himself he had come in the end at times to acquiesce in this result.

Still more decisive, however, was the third step in the development of Wesley's "Society." The clergy not only excluded the Wesleys from their pulpits, but often repelled them and their converts from the Lord's Supper. This was first done on a large scale, and with a systematic harshness and persistency, at Bristol, in 1740. Under these circumstances the brothers took the decisive step of administering the sacrament to their societies themselves, in their own meeting-rooms, both at Bristol and at Kingswood.

In 1741 Wesley entered upon his course of calling out lay preachers, who itinerated under his directions. To the societies founded and sustained with the aid of these preachers, who were entirely and absolutely under Wesley's personal control, the two brothers, in their extensive journeys, administered the sacraments as they were able. The helpers only ranked as laymen, many of them, indeed, being men of humble attainments and of unpolished ways.

In 1744 Wesley held his first Conference. The early Conferences were chiefly useful for the settlement of points of doctrine and discipline and for the examination and accrediting of fellow-laborers. They met yearly. Conferences were a necessity for Wesley, and became increasingly so as his work continued to grow upon him. It was inevitable also that the powers of the Conference, although for many years the Conference itself only existed as it were on sufferance, and only exercised any authority by the permission of its creator and head, should continually increase. The result was that in 1784 Wesley could no longer delay the legal constitution of the Conference, and that he was compelled, if he would provide for the perpetuation of his work, to take measures for vesting in trustees, for the use of "the people called Methodists," under the jurisdiction of the Conference as to the appointment of ministers and preachers, all the preaching places and trust property of the Connection. The legal Conference was defined as consisting of one hundred itinerant preachers named by Wesley, and power was given to the "legal hundred" continually from the first to fill up the vacancies in their own number, to admit and expel preachers, and to station them from year to year, no preacher being allowed to remain more than three years in one station.

By this measure Wesley's work was consolidated into a distinct religious organization, having a legally corporate character and large property rights.

In 1784, the American colonies having won their independence, it became necessary to organize a separate Methodism for America, where Methodist societies had existed for many years. Wesley gave formal ordination and letters of ordination to Doctor Coke, already a presbyter of the Church of England, as superintendent (or bishop) for America, where Coke ordained Francis Asbury as presbyter and superintendent (or bishop), and Coke and Asbury together ordained the American preachers as presbyters. From that ordination dates the ecclesiastical commencement of American Episcopal

Methodism—in which the bishops are only chief among the presbyters whom they superintend, superior in office but of the same order. The Episcopal Methodism of America represents to-day the largest aggregate of Protestant communicants and worshipers of the same ecclesiastical name to be found in any one nation in the world.

At the time of Wesley's death there were in Great Britain, the Isle of Man, and the Channel Islands 19 circuits, 227 preachers, and 57,562 members. In Ireland there were 29 circuits, 67 preachers, and 14,006 members. There were also 11 mission circuits in the West Indies and British America, 19 preachers, and 5,300 members. The number of members in the United States was returned as 43,265.

3. *Wesleyan Methodism after Wesley's Death (1791).* When Wesley died the Conference remained as the bond of union and fountain of authority for the Connection. But between the meetings of Conference Wesley had acted as patriarch and visitor with summary and supreme jurisdiction. The first need to be supplied after his death was an authority for the discharge of this particular function. In America Wesley had organized a system of bishops (presbyter-bishops), presbyters or elders, and deacons or ministers on probation. Among some of those preachers who had been most intimate with Wesley there was a conviction that his own judgment would have approved such a plan for England. No document, however, remains to show that such was his desire. The preachers, in their first Conference after Wesley's death, instead of appointing bishops, each with his diocese or province, divided the country into districts, and appointed district committees to have all power of discipline and direction within the districts, subject only to an appeal to the Conference, all the preachers exercising equal rights also in the Conference, the "legal hundred" merely confirming and validating *pro forma* the resolutions and decisions of the whole assembly.

At first the preachers stationed in the districts were instructed to elect their own chairmen, one for each district. But the plan was speedily changed, and the chairmen were elected each year by the whole Conference; and this method has been maintained ever since. The "district meetings"—as they are generally called—are still "committees" of the Conference, and have *ad interim* its power and responsibilities as to discipline and administration. Originally they were composed exclusively of preachers, but before many years had passed circuit stewards and district lay officers came to be associated with the preachers during the transaction of all the business except such as was regarded as properly pastoral.

The relation of the Conference to the government of the Connection having thus been determined, the question which next arose, and which occupied and indeed convulsed the Connection for several years (1792-95), was that of the administration of the sacraments, especially of the Lord's Supper, to the societies. The societies generally insisted on their right to have the sacraments from their own preachers. Many of the wealthier members, however, and in particular a large number of the trustees of chapels, opposed these demands. At length, between 1794 and 1795, after more than one attempt at compromise had been made by the Conference, the feeling of the societies as against the trustees became too strong to be longer resisted, and accordingly at the Conference of 1795 the "plan of pacification" was adopted, the leading provision being that, wherever the majority of the trustees of any chapel, on the one hand, and the majority of the stewards and leaders, on the other, consented to the administration of the sacra-

ments, they should be administered, but not in opposition to either the one or the other of these authorities. In England the Lord's Supper was always to be administered after the Episcopal form; in Scotland it might still, if necessary, be administered, as it had commonly been before, after the Presbyterian form. In any case, however, "full liberty was to be left to give out hymns and to use exhortation and extemporary prayer." The result was that within a generation the administration of the sacraments to the societies came to be the universal rule. By this legislation the preachers assumed the powers of pastors, in accordance, however, only and always with the desire and choice of their flocks. No formal service or act of ordination was brought into use till forty years afterward. All preachers on probation for the ministry, after the completion of their probation, were "received into full connection" with the Conference, this reception implying investment with all pastoral prerogatives. Modern Methodism has developed more fully and conspicuously the pastoral idea.

No sooner was the sacramental controversy settled than the further question as to the position and rights of the laity came to the front in great force. A comparatively small party, led by Alexander Kilham, imported into the discussion ideas of a republican complexion, and demanded that the members in their individual capacity should be recognized as the direct basis of all power, that they should freely elect the leaders and stewards, that all distinction in conference between ministers and laymen should be done away (elected laymen being sent as delegates from the circuits in equal number with the ministers), that the ministry should possess no official authority or pastoral prerogative, but should merely carry into effect the decisions of majorities in the different meetings. In the course of a very violent controversy which ensued, pamphlets and broadsheets, chiefly anonymous, from Kilham's pen, advocating his views and containing gross imputations on the ministers generally, and in particular on some not named but distinctly indicated, were disseminated through the societies. The writer was tried at the Conference of 1796, condemned for the publication of injurious and unjustifiable charges against his brethren, and by a unanimous vote expelled from the Conference. In the following year he founded the "New Connection," the earliest of the organized secessions from Wesleyan Methodism.

By the settlement now described the outlines of Methodism as an organized church were fairly completed. Many details have since been filled in, and many changes have been made in secondary arrangements, but the principles of development have remained unchanged. The Connection after 1797 had a long unbroken period of peaceful progress. The effect of the "Kilhamite" separation, indeed, was after 1797 not greatly felt by the parent body. The number of Methodists in the United Kingdom in 1796, the year of Kilham's expulsion, was 95,226; in 1797, it was 99,519; in 1798 the New Connection held its first conference, and reported 5,037 members, the number of the parent body being 101,682. Nor was it till 1806 that the New Connection reached 6,000.

The development of the pastoral position and character of the ministers of the body after 1797 could not but advance on a line parallel to the development of the position and claims of the laity. In 1818 the usage of the Conference was conformed to what had long been the ordinary unofficial custom, and the preachers began to be styled in the *Wesleyan Methodist Magazine* and in other official publications "Reverend," a fact which may seem trivial, but which in reality was of important significance.

In 1834, after the idea had been long entertained and the project had been repeatedly discussed, it was determined to establish a theological institution for the training of ministerial candidates. There are now four colleges, with two hundred and fifty students. In 1836 the practice of ordination by imposition of hands was adopted.

Such advances, however, as these in the general organization and development of the Connection, and especially in the status and professional training of the ministers, could not be made in such a body without offense being given to some, whose tendencies were to disallow any official distinction between the ministry and the laity, and who also objected to the use of the organ. This leveling element was strong in the West Riding of Yorkshire, and in 1828, on the placing of an organ in Brunswick Chapel, Leeds, by the trustees, with the consent of the Conference, a violent agitation broke out. The consequence was a disruption, the first since 1798, under the title "Protestant Methodists." But this was absorbed, some years later, in a more considerable secession.

The decision of the Conference in 1834 to provide a college for the training of ministerial candidates gave special offense to the malcontents. Such an occasion was all that was wanting for the various discontents of the Connection to gather to a head. The demands made by the agitators proceeded on a basis of democratic ecclesiasticism such as it is very difficult to apply successfully to a system of associated churches. The result was a third secession, based on the same general ground of ecclesiastical principles as the two preceding, which was organized in 1836, and with which the "Protestant Methodists" eventually coalesced. This new secession was known first as the "Wesleyan Methodist Association;" but for a number of years past it has been merged in a still larger body of seceders designated "The Methodist Free Churches." Its leader at the first was the Rev. Dr. Warren, who left it, however, not many months after it was formed, and took orders in the Church of England.

The controversies of 1835-36 left their mark on the legislation and official documents of the Connection. The principles of 1797 remained intact, some farther guards only being added to prevent any danger of hasty or irresponsible action on the part of superintendents, and at the same time "minor district meetings" were organized in order to facilitate appeals. One error was, however, committed by the Conference. In 1797 no provision had been made for bringing the circuit, through its quarterly meeting, into direct relations with the Conference. In 1836 a right of direct memorial to the Conference was given to the circuit quarterly meeting; but it was so fenced round with conditions and limitations as to make it practically inoperative, and at the same time provocative of suspicion and irritation.

The effect of the secession of 1836 on the general progress of the Connection was not great. The number of members reported in 1835 in Great Britain and Ireland was 371,251 (there being a decrease in England of 951), in 1836 381,369, in 1837 384,723. For the next ten years the advance of the Connection in numbers and in general prosperity was apparently unprecedented. The Centenary Fund of 1839-40 amounted to £221,000. In the midst, however, of all the outward prosperity of Methodism—partly perhaps in consequence of it—very perilous elements were at work. The revolutionary ideas of the Chartist period (1840-48) and of Continental politics (1848-49) reacted on Wesleyan Methodism as the political ideas of 1791 and of 1831 had done at those epochs. The embers of old controversies—ecclesiastical, quasi-political, and personal—still smoldered, and

at length burst into fresh flame. In 1849 the internal dissensions reached their climax. In that year James Everett, the chief author of the discontent, and two other ministers, Samuel Dunn and William Griffith, who had identified themselves with him, were expelled. A disastrous agitation followed. No distinct secession took place till after the Conference of 1850. The union of the "Methodist Free Churches," in which was incorporated the "Wesleyan Association" (of 1836), was formed by the seceders. The "New Connection" also received some thousands of the seceders into its ranks. But by far the greatest part of those who left went with neither of these bodies.

Between 1850 and 1855 the Connection in Great Britain and Ireland lost 100,000 members, and not till 1856 did it begin to recover. In that year the numbers were returned as 282,787, showing a small increase over the preceding year. Since then peace and unity have prevailed unbroken.

In doctrine all branches of Methodism are substantially identical. Wesley's doctrines are contained in fifty-three sermons known as the "four volumes" and in his *Notes on the New Testament*. The Conference has, however, published two catechisms, one for younger, the other for older children, of which a new and carefully revised edition has lately been completed. In general, Wesleyan theology is to be described as a system of evangelical Arminianism. In particular, Wesleyan divines insist on the doctrines of original sin, general redemption, repentance, justification by faith, the witness of the spirit, and Christian perfection—or, as it has been customary for Methodists to say, the doctrines of a "present, free, and full salvation." By the witness of the Spirit is meant a consciousness of the Divine favor through the atonement of Jesus Christ. Wesleyans have often been represented as holding the Calvinistic doctrine of "assurance." The word, however, is not a Wesleyan phrase, and assurance, so far as it may be said to be taught by Methodists, signifies, not any certainty of final salvation, but merely a "sense of sin forgiven."

II. AMERICAN EPISCOPAL METHODISM.

The beginnings of American Methodism are traceable to the year 1766, when a few pious emigrants from Ireland introduced Methodism into New York. On receiving an appeal, in 1768, from the New York Methodists, who were engaged in building a preaching-house, Wesley laid the case of America before the Conference at Leeds in 1769, and two preachers, Boardman and Pilmoor, volunteered to go to the colonies. Boardman went to New York, Pilmoor to Philadelphia. In 1771 two other Methodist itinerants, Francis Asbury—the most famous name in American Methodism—and Richard Wright came out to America. In 1773 Thomas Rankin, a preacher of experience sent out by Wesley, held the first Conference in Philadelphia, when there were ten itinerant preachers and 1,160 members. After the breaking out of the War of Independence the English Methodist preachers were unpopular, and all but Francis Asbury went back to England. At the end of the war, however, in 1784, Wesley sent out Doctor Coke, and American Methodism was organized as an independent church, with Doctor Coke and Francis Asbury as its presbyter-bishops. The history of American Methodism since that period is too vast and complicated for any attempt to be made to summarize it here. Methodism is more properly national in its character as an American church than any church in the country. In Massachusetts and some other of the New England States it is less powerful than Congregationalism, which still retains there much of its ancient predominance; in the city of New

York it is less powerful than Presbyterianism, and, indeed, occupies a position generally less influential than might have been expected. But in Philadelphia it is very powerful; so also in Baltimore and in Cincinnati; if not strong in New York city, it is very strong in the State; and generally throughout the Western and Midwestern States it is the prevalent form of faith and worship. In the South, also, it is more powerful than any other church. American Methodism is Episcopal. But its Episcopacy is neither prelatical nor diocesan. The bishops are superintending presbyters, and they visit the whole territory of Methodism in rotation, holding (presiding over) the annual Conferences. These Conferences are purely ministerial. But the General Conference, which meets once in four years, and which is the Conference of legislation and final appeal, is mixed and representative. The first General Conference was held in 1792, the first delegated or representative Conference in 1812, the first mixed or ministerial-and-lay General Conference in 1872. There were till lately no district assemblies in the Episcopal Methodism of America, and now there are but few. The bishops maintain the unity of the Connection in the interval between the General Conferences, by their visitation and by their conjoint council. A sub-episcopal class of ministers also, called presiding elders, supplement the action and superintendency of the bishops. These preside over districts, holding all the circuit quarterly meetings, and holding the district meetings, if any such meetings have been organized. American Episcopal Methodism is distributed into five distinct sections or churches, which, however, differ from each other in no points of any importance as respects organization or discipline, still less doctrine. The American Methodist Episcopal Church South became a separate organization in 1847 by reason of the slavery controversy. The colored churches, of which there are three, sprang up distinctly from local causes. The following are the latest (1902) available statistics:

	Minist's	Churches	Lay Members
Methodist Episcopal Church	17,521	26,021	2,716,437
" " " South	6,041	14,244	1,457,884
A. E. Zion Church	5,659	5,775	673,504
Colored M. E. Church	3,155	2,906	536,271
	2,187	1,300	199,206

In the Methodist Episcopal Church alone there are 100 annual Conferences, visited by twelve bishops. This church has more than twenty universities, of which some are distinguished schools of learning. Boston University is one of the most recent and one of the chief. The principal foreign missions are in India, China, and Japan. The Methodist Church South also has some influential universities, particularly that at Nashville, and has missions, in particular in Japan and China.

Besides these Methodist Episcopal churches, with their total of 3,358,000 church members, there are two other churches which do not assume the name at all, but are yet essentially Methodist in doctrine and discipline, not varying in any important particulars from the Episcopal Methodism of America. Of these one is called the United Brethren, with 157,000 members, the other the Evangelical Association, with 113,000 members.

Non-Episcopal American Methodism.—The bodies included under this head are chiefly secessions from the original stock of American Methodism, founded on principles of democratic church government, analogous to those of the English Methodist secessions. The only

considerable body, however, is the Methodist Protestant Church, with 125,000 members. The minor bodies, four in number, count all together less than 60,000 members, the principal being the American Wesleyan Church, with 25,000 members.

METHODIUS, the apostle of the Slavs, was a native of Thessalonica, and was born about the year 825. His nationality is unknown, but most probably he was a Græcized Slav; the family of which he was a member appears to have been one of considerable social distinction, and he himself had already attained high official rank in the government of Macedonia before he determined to abandon his secular career and embrace the monastic life. His younger brother Constantine (better known as Cyril, the name he adopted at Rome shortly before his death) had also distinguished himself as a secular "philosopher" in Constantinople before he withdrew to the cloister and to solitude. Constantine died in Rome, but Methodius, after satisfying the pope of his orthodoxy and obedience, went back to his labors in "Moravia" as archbishop of Pannonia. His province appears to have been, roughly speaking, coextensive with the basins of the Raab, Drave, and Save, and thus to have included parts of what had previously belonged to the provinces of Salzburg and Passau. The date of the death of Methodius is variously given; the most trustworthy tradition says that it took place on April 6, 885.

METHYL, a chemical term which until lately was used in two radically different senses, namely, as designating either the atom-group CH_3 , which in numberless chemical formulae figures as a "radical" or a gaseous substance of the same composition, which, however, nowadays is generally called "dimethyl," to distinguish it from the radical.

Methyl-Alcohol.—This substance, in ordinary practice, is never made synthetically, but simply extracted from wood-spirit, a commercial substance which is produced industrially in the dry distillation of wood. The wood-spirit is contained in the aqueous portion of the tar produced in this operation, along with acetic acid. To recover both, the tar-water is neutralized with lime and distilled, when the acetate remains, while the spirit distils over, along with a deal of water, which, however, is easily removed, as far as necessary, by redistillation and rejection of the less volatile parts. The "crude" wood-spirit, as thus obtained, is not unlike in its general properties to ordinary spirits of wine, from which, however, it is easily distinguished by its abominable smell. The ordinary commercial article, besides a variable percentage of water, contains from 35 to 80 per cent. of methyl-alcohol; the rest consists chiefly of acetone.

Pure methyl-alcohol is a colorless liquid similar in its general properties, in its behavior to other chemically inert liquids, and in its action as a solvent, to ordinary absolute alcohol, from which, however, it differs by the entire absence from it of all spirituous odor. A preparation which smells of wood-spirit may be condemned at once as impure.

METRONOME, an instrument for denoting the speed at which a musical composition is to be performed. Its invention is generally, but falsely, ascribed to Johann Nepomuk Maelzel, a native of Ratisbon (1772-1838). It consists of a pendulum swung on a pivot; below the pivot is a fixed weight, and above it is a sliding weight that regulates the velocity of the oscillations by the greater or less distance from the pivot to which it is adjusted. The silent metronome is impelled by the touch, and ceases to beat when this impulse dies; it has a scale of numbers marked on the pendulum, and the upper part of the sliding weight is placed under that number which is to indicate the quickness of a stated note.

METSU, GABRIEL, a Dutch painter of celebrity (born in 1630, died after 1667), is one of the few artists of renown in Holland whose life has remained obscure.

METTERNICH, CLEMENS WENZESLAUS, PRINCE, first minister of Austria from 1809 to 1848, was the son of a Rhenish nobleman employed in high office by the Austrian court. He was born at Coblenz in 1773. At the age of fifteen he entered the university of Strasbourg. The French Revolution was then beginning. Metternich was an aristocrat and a conservative by birth and nature. His marriage, in 1795, with the Princess Kaunitz, a granddaughter of the famous minister, fixed him in the highest circle of Austrian nobility. His first contact with the great political world was at the congress of Rastadt in 1798, where, under the auspices of the victorious French republic, arrangements were made for compensating the German princes and nobles whose possessions on the left bank of the Rhine had been ceded to France by the peace of Campo Formio. In 1801 Metternich was appointed Austrian ambassador at Dresden, and in 1803 he was promoted to Berlin; but he had hardly become as yet a prominent man in Europe. His stay at Berlin was the turning-point of his life. The war of the third coalition was impending. Austria united with England and Russia against Napoleon, and the task of the youthful ambassador was to win over the court of Berlin to the cause of the allies. Metternich seems to have done all that it was possible for him to do; but Prussia persisted in its neutrality. The earnestness with which Metternich had worked against France did not prevent him from remaining on the friendliest terms with M. Laforest, the French ambassador at Berlin; and so agreeable an account of him was transmitted to Paris by his rival that, at the close of the conflict, Napoleon himself requested that Metternich might henceforward represent Austria at the Tuileries. Metternich was accordingly sent to Paris in 1806.

The sudden overthrow of Prussia, and the alliance between France and Russia which was made at Tilsit in 1807, added immeasurably to the difficulties of the court of Vienna. It became clear that Napoleon was intending to dismember Turkey, and to gain for himself some part of the spoils of the Ottoman empire. Metternich's advice was that Austria should endeavor to detach the czar from the French alliance, and by this means frustrate the plans of partition; but, should Russia hold fast to Napoleon, that Austria itself should unite with the two aggressors, and secure its share of Turkey. Oriental affairs, however, fell into the background, and in the summer of 1808 Metternich was convinced that Napoleon was intending to attack Austria, though not immediately. He warmly supported Count Stadion's policy in raising the forces of Austria to the highest strength; and, although he did not share in the minister's hopes in a general rising throughout Germany, he expressed in his dispatches no distrust of the power of Austria to cope with Napoleon. This is the more singular because, after the disastrous issue of the campaign of 1809, Metternich seems to have taken credit for having opposed the policy of war. Napoleon again captured Vienna; the battle of Wagram was lost; and after a long negotiation Austria had to purchase peace by the cession of part of Austrian Poland and of its Illyrian provinces. Metternich, who had virtually taken Count Stadion's place immediately after the battle of Wagram, was now installed as minister of foreign affairs. The first striking event that took place under his administration was the marriage of Marie Louise, daughter of the emperor Francis, to his conqueror Napoleon. Metternich seems, in spite of his denials, to

have been the real author of the family union between the houses of Hapsburg and Bonaparte, which guaranteed Austria against danger from the east, at the same time that it gave it at least some prospect of security from attack by Napoleon, and enabled Metternich to mature his plans for the contingency of an ultimate breach between France and Russia. In 1812 this event occurred. Metternich, in nominal alliance with Napoleon, sent a small army into southern Russia, allowing it to be understood by the czar that the attack was not serious. Then followed the annihilation of the French invaders. While Prussia, led by its patriots, declared war against Napoleon, Metternich held his hand, merely stating that Austria would no longer regard herself as a subordinate ally, but would act with all her force on one side or the other. The result of the reserve was that Metternich could impose what terms he pleased on Russia and Prussia as the price of his support. The armies of these two powers, advancing into central Germany, proved no match for the forces with which Napoleon took the field in the spring of 1813; and the hard-fought battles of Lützen and Bautzen resulted in the retreat of the allies. After the combatants had made an armistice, Metternich tendered Austria's armed mediation, requiring Prussia to content herself with the restoration of her territory east of the Elbe, leaving Napoleon's ascendancy in Germany almost untouched. Napoleon, after a celebrated interview with Metternich, madly rejected terms so favorable that every Prussian writer has denounced Metternich's proposal of them as an act of bitter enmity to Prussia. On the night of August 10th the congress of Prague, at which Austria, as armed mediator, laid down conditions of peace, was dissolved.

Austria declared war against Napoleon. The battle of Leipsic and the campaign of 1814 in France followed, Metternich steadily pursuing the policy of offering the most favorable terms possible to Napoleon, and retarding the advance of the allied armies upon the French capital. Metternich had nothing of that personal hatred toward the great conqueror which was dominant both in Prussia and in England; on the contrary, though he saw with perfect clearness that, until Napoleon's resources were much diminished, no one could be safe in Europe, he held it possible to keep him in check without destroying him, and looked for the security of Austria in the establishment of a balance of power in which neither Russia nor France should preponderate, while Prussia should be strictly confined within its own limits in northern Germany. The assistance of the Austrian army, which was no doubt necessary to the allies, had, so far as related to Prussia, been dearly purchased. When, at the beginning of 1813, Prussia struck for the freedom of Germany, its leading statesmen and patriots had hoped that the result of the war of liberation would be the establishment of German unity. It was no part of Metternich's policy to allow anything so revolutionary as German unity to be established, least of all under the influence of Prussian innovators. He made treaties with the king of Bavaria and Napoleon's other German vassals, guaranteeing them, in return for their support against France, separate independence and sovereignty when Germany should be reconstructed. Accordingly, though the war resulted, through Napoleon's obstinate refusal of the terms successively offered to him, in the limitation of France to its earlier boundaries and in a large extension of Prussia's territory, the settlement of Germany outside Prussia proceeded upon the lines laid down by Metternich, and the hopes of unity raised in 1813 were disappointed. A German confederation was formed, in which the minor sovereigns retained supreme power within their own states, while

the central authority, the federal diet, represented, not the German nation, but the host of governments into which the nation was divided. Metternich advised the emperor Francis of Austria to decline the old title of German emperor, disliking any open embodiment of the idea of German unity. In this unprogressive German policy Metternich was completely successful. His great opponent, Stein, the champion of German unity and of constitutional systems, abandoned his work in despair, and refused the useless post of president of the diet, which Metternich offered to him.

The second branch of Metternich's policy in 1813-14 was that which related to Italy. Following the old maxims of Austrian statesmanship, Metternich aimed not only at securing a large territory beyond the Alps, but at making the influence of Austria predominant throughout the Italian peninsula. The promises of national independence which had been made to the Italians when they were called upon to rise against Napoleon were disregarded. In the secret clauses of the first treaty of Paris the annexation of both Lombardy and Venetia was guaranteed to Austria, and the rest of Italy was divided into small states as of old. Napoleon's return from Elba led to the downfall of Murat, who had been allowed to retain the kingdom of Naples, and the reunion of that country with Sicily, under the Bourbon Ferdinand. After the second overthrow of Napoleon, Metternich endeavored to make every Italian sovereign enter into a league under Austria's presidency. Ferdinand of Naples accepted the position of vassal, but the pope and the king of Sardinia successfully maintained their independence. With the construction of the German federation, and the partial construction of an Italian federation, both under Austria's guidance, the first part of Metternich's career closes. He had guarded Austria's interests with great skill during the crises of 1813 and 1814.

The second part of Metternich's career, which extends from 1815 to 1848, is that of a leader of European conservatism. It is difficult to describe his attitude toward almost all the great questions which were now arising as any but one of absolute blindness and infatuation. He acknowledged that exceptional circumstances in the past had made it possible for England to exist under a constitution; he knew that France would not surrender the *Charta* given to it by King Louis XVIII.; but in all other great states he maintained that there were no alternatives but absolute monarchical government and moral anarchy. His denunciations of liberals and reformers everywhere and at all times are perfectly childish; and in many instances his hatred of change led him into errors of judgment not surpassed in the annals of political folly. When Napoleon fell, there was a prospect of the introduction of constitutional government throughout a great part of Europe.

Metternich's advice, tendered with every grace of manner and with the most winning and persuasive art, was indeed not hard for rulers to accept, for he simply recommended them to give up nothing that they had got. It was at the congress of Aix-la-Chapelle (1818) that the retrograde tendency, which was now succeeding to the hope of 1815, first gained expression. An agitation among the students of the German universities had caused some scandal in the previous year, and secret societies had just been discovered in Russia. A few months later the murder of Alexander's German agent, Kotzebue, by a fanatical student, gave Metternich an excellent pretext for organizing a crusade against German liberty. A conference of ministers was held at Carlsbad. The king of Prussia allowed his representative to follow Metternich's lead. The resistance of the constitutional minor states proved of no avail; and a

series of resolutions was passed which made an end of the freedom of the press throughout Germany, and subjected the teaching and the discipline of the universities to officers of state. The king of Prussia broke his promise of establishing a national representation, and satisfied his conscience by creating certain powerless provincial diets, exactly as Metternich had recommended him. Throughout Germany at large a system of repression was carried out against the advocates of constitutional right. The press was silenced; societies were dissolved; prosecutions became more and more common. While Metternich imagined himself to be stifling the spirit of discontent, he was in fact driving it into more secret and more violent courses, and convincing eager men that the regeneration of Germany must be sought not in the reform but in the overthrow of governments.

Meanwhile revolution broke out in Spain and Italy. Ferdinand of Spain, who had restored despotism, was compelled, in March, 1820, to accept the constitution of 1812, which he had subverted. The same constitution was accepted a few months later by Ferdinand of Naples. Spain was outside Metternich's range, but his hand fell heavily upon Naples. A congress of the great powers was held at Troppau in October, 1820. Metternich, who was president, as he had been at Vienna, and continued to be in later congresses, completely won over the czar to his own views. Resolutions in favor of an intervention, if necessary by force of arms, against the Neapolitan liberal government were adopted by Austria, Russia, and Prussia, though England and France held aloof. A letter was concocted by Metternich for King Ferdinand to send to his subjects, informing them that the powers would not permit the constitution to exist, and that, in default of their submission, the allied courts would employ force. The British Government, while protesting against the joint action of the three powers as an assumption of international sovereignty, was perfectly willing that Austria, as a state endangered by Neapolitan revolution, should act on its own account. Metternich, however, continued to treat the Neapolitan question as the affair of Europe, and maintained his concert with Russia and Prussia. Early in 1821, an Austrian force, acting in the name of the allies, entered central Italy. The armies opposed to it collapsed, and the Austrians entered Naples on March 24th.

At the congress of Verona, held in 1822, the affairs of Spain were considered by the powers. In the end, the Spanish constitution was overthrown by a French invading army; but, though the arm employed was that of France, the principle of absolutism which animated the crusade was that which Metternich had made his own. A severe check, however, now met him in another quarter. Greece had risen against Turkish rule in 1821. Metternich's attitude toward the Greeks was for some time one of unqualified hostility. He reverted to the principle of maintaining Turkey at all costs against a Russian advance southward; and he attributed the Greek movement to the efforts of Russian agitators unauthorized by the czar. His desire was that the sultan should deprive Russia of all possible cause for complaint as regarded its own separate interests, and so gain freedom to deal summarily with the Greeks. Metternich's hopes failed, partly through the obstinacy of the Turks, partly through the wavering conduct of Alexander, and partly through the death of Castlereagh and the accession of Canning to power. It was in great part owing to Canning's moral support that Greece ultimately became an independent state; and the extraordinary violence of Metternich's language whenever he mentions this English statesman marks only too well the opposite character of his aims.

The Greek question, however, was only the first on which the judgment of events was now beginning to declare itself against Metternich and all his principles. The French revolution of 1830 shattered the moral fabric which he had so proudly inaugurated, and in great part himself raised, in 1815. The accord that grew up between England and France now made any revival of the kind of presidency that he had once held in Europe impossible. He was, indeed, bold and rapid in throwing troops into the papal territory when revolutionary movements broke out there in 1831 and 1832, though war with France seemed likely to result from this step. He was as unsparing as he had been in 1819 in suppressing the agitation which after 1830 spread from France to Germany; and the union of the three eastern courts was once more exhibited in the meeting of the monarchs, which took place at Münchengrätz in 1837, and in a declaration delivered at Paris, insisting on their right of intervention against revolution in other countries. It was, however, the new czar of Russia, Nicholas, who was now the real head of European conservatism; and the stubborn character, the narrow, unimaginative mind of this prince made it impossible for Metternich to shape his purposes by that delicate touch which had been so effective with his predecessor. But in Austria itself Metternich continued without a rival. In 1835 the emperor Francis, with whom he had worked for nearly thirty years, died. Metternich, himself falling into the mental habits of old age, remained at the head of the state till 1848. The revolution of that year ended his political career. He resigned office with the dignity of demeanor which had never failed him; his life was scarcely safe in Vienna, and the old man went for awhile to England, which he had not visited since 1794. Living on till June, 1859, he saw every great figure of his earlier life, and many that had appeared on the horizon since his own prime, pass away; and a few more months of life would have enabled him to see the end of that political order which it had been his life-work to uphold; for the army of Napoleon III. was crossing the Sardinian frontier at the moment when he died, and, before a second summer had gone, Victor Emmanuel had been proclaimed king of Italy.

METZ, the capital of German Lorraine, and one of the strongest fortresses in Europe, is situated at the confluence of the Moselle and the Seille, 80 miles to the northwest of Strasburg, and 190 miles to the east of Paris. It is the seat of a military governor, the judicial and administrative authorities of Lorraine, a Roman Catholic bishop, Protestant and Jewish consistories, and a chamber of commerce. The general appearance of the town is quaint and irregular, but there are also many handsome modern streets. The Moselle flows through it in several arms, crossed by fourteen or fifteen bridges. In the southwest corner of the town is the esplanade, an extensive open space commanding a fine view of the fertile "Pays Messin" around Metz. The most interesting of the ten city gates is the Porte d'Allemagne, a castellated structure erected in 1445, and still bearing traces of the siege of Charles V. Metz contains seven Roman Catholic churches, two Protestant churches, and a synagogue. The cathedral, with huge pointed windows, slender columns, and numerous flying buttresses, was begun in the thirteenth century, and finished in 1546, and belongs to the decadence of the Gothic style. The Gothic churches of St. Vincent and St. Eucharius, and the handsome garrison-church, completed in 1881, also deserve mention. Among secular buildings the most important are the large covered market, the town-hall, the palace of justice, the theater, the governor's house, and the various buildings for military purposes. The public library contains

35,000 volumes, including an extensive collection of works relating to the history of Lorraine. In the same building is the museum, which contains a picture gallery, a numismatic cabinet, and a collection of specimens of natural history. Metz also possesses several learned societies and charitable institutions, a gymnasium, three seminaries, and a military academy. The cemetery of Chambière contains the graves of 8,400 French soldiers who died here in 1870.

The commerce and industry of Metz have not yet entirely recovered from the blow inflicted by the withdrawal of French capital in 1871. The principal articles of manufacture are leather, coarse cloth and canvas, gunpowder, arms, needles, billiard tables, hats, and artificial flowers. There are several large iron-works in the neighborhood. The trade of Metz is chiefly carried on in leather, timber, wine, brandy, liquors, beer, preserved fruits, and hardware. A large annual fair is held here. The civil population of Metz, which in 1869 amounted to 48,066, sank in 1872 to 33,134. Since then it has steadily increased, and is now (1902) 58,462, about half Germans. The garrison of Metz consists of 10,000 men, or, including the surrounding forts, nearly 16,000.

On the partition of the Carolingian realms in 843 Metz fell to the share of the western kingdom as the capital of Lorraine. Its bishops, whose creation reaches back to the fourth century, now began to be very powerful. Metz acquired the privileges of a free imperial town in the twelfth century, and attained great commercial prosperity. In 1552 it fell into the hands of the French through treachery, and was heroically and successfully defended against Charles V. by the young duke of Guise. It now sank to the level of a French provincial town, and its population dwindled from 60,000 to 22,000 (1698). At the peace of Westphalia Metz, with Toul and Verdun, was formally ceded to France, in whose possession it remained for upward of two centuries. In August, 1870, the successes of the German troops compelled Marshal Bazaine and the French army of the Rhine to seek shelter behind the fortifications of Metz, which was forthwith subjected by the Germans to a rigorous blockade. After an investment of ten weeks, during which not a single shot was fired at the town, Bazaine capitulated, surrendering to the victors an army of nearly 180,000 men, several hundred cannon, and an immense quantity of military stores of all kinds. By the peace of Frankfurt in 1871, Metz was again united to the German empire. Marshal Fabert and Generals Custine and Kellermann were natives of Metz.

As a fortress Metz has always been of the highest importance, and it now ranks with Strasburg as one of the two great bulwarks of the west frontier of Germany. The original town walls were replaced by ramparts in 1550, and the citadel was built in 1566. In 1674 the works were reconstructed by the celebrated military engineer Vauban. Under Napoleon III. the fortress was strengthened to meet the demands of modern warfare, and since 1871 the Germans have spared neither time nor money in completing and supplementing his plans. The present fortifications of Metz consist of two lines—an inner circle of bastions and ramparts inclosing the city itself, and an outer circle of large detached forts on the surrounding hills. The inner line is strengthened by two citadels, one of which is advanced as a tête-de-pont on the left bank of the Moselle. The outer circle consists of nine or ten large forts connected with each other by smaller fortifications and commanding all the approaches to the city.

MEULEN, ANTONY FRANCIS VAN DER, was called to Paris about 1666, by Colbert, at the instance of Le

Brun, to fill the post of battle painter to Louis XIV. Born in 1634, at Brussels, he had at an early age eclipsed his master Peter Snayers, and the works executed by him for the king of France during the campaigns of Flanders (1667) so delighted Louis that from that date Van der Meulen was ordered to accompany him in all his expeditions. In 1673 he was received into the French Academy, and attained the grade of counselor in 1681. He died at Paris in 1690.

MEURTHE-ET-MOSELLE, a department in the northeast of France, formed in 1871, out of those parts of the old departments of Meurthe and Moselle which continued French, and deriving its name from the two principal rivers which water it. Prior to 1790, it belonged to ancient Lorraine, or to one or other of the bishoprics of Toul, Metz, and Verdun. Population (1901), 484,002.

MEUSE, MAESE, or MAAS, a river of France, Belgium, and Holland, discharging into the North Sea or German Ocean, has a course (variously measured) of some 500 or 550 miles, about 300 miles lying within France.

MEUSE, a department in the northeast of France, formed out of a part of Lorraine and portions of the Three Bishoprics, the Clermontais, and Champagne, derives its name from the river by which it is traversed from south to north. More than half the surface of the department consists of culturable lands, one-fourth of forest, one-tenth of meadow land. The chief waterways are the canal connecting the Marne with the Rhine, and the canal of the Meuse; the two together have a length of 146 miles. The population of the department in 1901 was 283,136. Bar-le-Duc (population in 1901 about 20,000) is the capital.

MEXICO. The name Mexico is connected with the name of the group of American tribes calling themselves *Mexica* (sing. *Mexicatl*), or *Azteca*. The word is related to or derived from the name of the Mexican national war-god Mexitl, better known as Huitzilopochtli. The Aztecs from the twelfth century appear to have migrated from place to place over the mountain-walled plateau of *Anahuac*, the country "by the water," so called from its salt lagoons, and which is now known as the valley of Mexico. About 1325 they founded on the lake of Tezcuco the permanent settlement of Mexico Tenochtitlan, which is still represented by the capital city Mexico. The name Mexico was given by the Spanish conquerors to the group of countries over which the Aztec power more or less prevailed at the time of the European invasion. Eventually Mexico and New Mexico came to designate the still vaster region of Spanish North America, which (till cut down by changes which have limited the modern republic of Mexico) reached as far as the Isthmus of Panama on the south and took in California and Texas on the north.

When, early in the sixteenth century, the Spaniards found their way from the West India Islands to this part of the mainland of America, they came in view of nations cultured high above the level they had hitherto met with in the New World, with organized armies, official administrators, courts of justice, high agriculture and mechanical arts, and stone buildings whose architecture and sculpture were often of dimensions and elaborateness to astonish the builders and sculptors of Europe. How a population of millions could inhabit a world whose very existence had been till then unknown to geographers and historians, and how its nation could have reached so high a grade of barbaric industry and grandeur, was a problem which naturally excited the liveliest curiosity of scholars, and gave rise to a whole literature.

Real information as to the nations of Mexico before

Spanish times is very imperfect, but not altogether wanting. The remarks made by the accurate and experienced observer Alexander von Humboldt, who had seen more American tribes than almost any traveler, are still entitled to the greatest weight. He considered the native Americans of both continents to be substantially similar in race-characters. Such a generalization will become sounder if, as is now generally done by anthropologists, the Eskimo with their pyramidal skulls, dull complexion, and flat noses are removed into a division by themselves. Apart from these polar nomads, the American indigenes group roughly into a single race or division of mankind, of course with local variations. If our attention is turned to the natives of Mexico especially, the unity of type will be found particularly close. The native population of the plateau of Mexico, mainly Aztecs, may still be seen by thousands without any trace of mixture of European blood. They are considerably like the Mongoloid peoples of North and East Asia (less so to the Polynesians); so that the tendency among anthropologists is now generally to admit a common origin, however remote, between the tribes of Tartary and of America. This original connection, if it may be accepted, would seem to belong to a long-past period, to judge from the failure of all attempts to discover an affinity between the languages of America and Asia. The original peopling of America may well date from the time when there was continuous land between it and Asia.

It would not follow, however, that between these remote ages and the time of the discovery of the New World by Columbus no fresh immigrants can have reached America. We may put out of the question the Scandinavian sea-rovers who sailed to Greenland about the tenth century, and appear afterward to have coasted New England (see AMERICA), but do not seem to have found their way far enough southward for their visit to have any effect on Mexico. But at all times communication has been open from East Asia and even the South Sea islands to the west coast of America. The importance of this is evident when we consider that Japanese junks now drift over by the ocean current to California at the rate of about one a year, often with some of the crew still alive. Further north, the Aleutian islands offer a line of easy sea passage, while in northeast Asia, near Behring's Strait, live Chukchi tribes who carry on intercourse with the American side; the presence of Eskimo in this part of Asia is so plainly due to local migration that it is neglected in comparing the languages of the two continents. Asiatics, such as Japanese or Kurile Islanders, if they found their way in small numbers to America and merged into native tribes, might hardly leave descendants distinguishable from the rest of the population even in the first generation, nor introduce their own language. What gives a more solid interest to the question of Asiatic influence in America is that, though neither the evidence of features nor of language has substantiated it, there are details of Mexican civilization which are most easily accounted for on the supposition that they were borrowed from Asia. They do not seem ancient enough to have to do with a remote Asiatic origin of the nations of America, but rather to be results of comparatively modern intercourse between Asia and America, probably since the Christian era. Humboldt compared the Mexican calendar with that in use in eastern Asia. Humboldt also discussed the Mexican doctrine, represented in the native pictures, of four ages of the world belonging to water, earth, air, and fire, and ending respectively by deluge, earthquake, tempest, and conflagration.

Actual documents of native Aztec history, or copies of them, are still open to the study of scholars, while after



Capital of the Republic @ Capitals of States @
Railroads ——— Submarine Telegraph Lines ———

Hamond's & Co. Map of Mexico.
Copyright, 1904, by C.S. Hammond & Co., N.Y.

the conquest interpretations of these were drawn up in writing by Spanish-educated Mexicans, and histories founded on them with the aid of traditional memory were written by Ixtlilxochitl and Tezozomoc. In Central America the rows of complex hieroglyphs to be seen sculptured on the ruined temples probably served a similar purpose up to the time of the Spanish invasion. The documents purporting to be histories, written down by natives in later times, thus more or less represent real records of the past, but the task of separating the preponderant mythical part from what is real history is of the utmost difficulty. Turning to the native chronicles of the Mexican nations, these are found to be substantial dated records, going back to the twelfth or thirteenth century, with some vague but not worthless recollections of national events from times some centuries earlier. These last-mentioned traditions, in some measure borne out by linguistic evidence of names of places, tribes, and persons, point to the immigration of detachments or branches of a widespread race speaking a common language, which is represented to us by the Aztec, still a spoken language in Mexico. To this nation is ascribed not only the oldest but the highest culture of the Nahuatl nations; to them was due the introduction of maize and cotton into Mexico, the skillful workmanship in gold and silver, the art of building on a scale of vastness still witnessed to by the mound of Cholula, said to be Toltec work; the Mexican hieroglyphic writing and calendar are also declared to have been of Toltec origin. With the Toltecs is associated the mysterious tradition of Quetzalcoatl, a name which presents itself in Mexican religion as that of a great deity, god of the air, and in legend as that of a saintly ruler and civilizer. His brown and beardless worshipers described him as of another race, a white man with noble features, long black hair and full beard, dressed in flowing robes. He came from Tullan or from Yucatan (for the stories differ widely), and dwelt twenty years among them, teaching men to follow his austere and virtuous life, to hate all violence and war, to sacrifice no men or beasts on the altars, but to give mild offerings of bread and flowers and perfumes, and to do penance by the votaries drawing blood with thorns from their own bodies. Legend tells stories of his teaching men picture-writing and the calendar, and also the artistic work of the silversmith; but at last he departed, some say toward the unknown land of Tlapallan, but others to Coatza-cualco on the Atlantic coast on the confines of Central America. Native tradition held that when Quetzalcoatl reached the Atlantic he sent back his companions to tell the Cholulans that in a future age his brethren, white men and bearded like himself, should land there from the sea where the sun rises, and come to rule the country. About 1430 took place the triple alliance of the Acolhua, Aztec, and Tepanec kings, whose capitals were Tezcuco, Mexico, and Tlacopan, the latter standing much below the other two. In fact the Aztecs now became so predominant that the rest of native history may be fairly called the Aztec period, notwithstanding the picturesque magnificence and intellectual culture which made Tezcuco celebrated under Nezahualcoyotl and his son Nezahualpilli. With the Spanish conquest under Hernando Cortes (see CORTES), the native history of Mexico comes to an end.

THE REPUBLIC OF MEXICO.

Mexico, Aztec *Mexitli* (Estados Unidos de Mexico), is a federal republic in North America, bounded north by the United States (California, Arizona, and New Mexico), east by Texas and the Gulf of Mexico, south by Guatemala and British Honduras, where the boundary lines

are still partly undetermined, west by the Pacific Ocean. Mexico stretches about 1,950 miles north-northwest and south-southeast, with a mean breadth of 400 miles. It has a coast-line of nearly 6,000 miles—about 4,200 on the Pacific and 1,600 on the Atlantic. The seaboard is little varied, either by deep inlets, bold headlands, broad estuaries, or large islands. On the west side are the vast Gulf of California, in outline somewhat resembling the Red Sea, and so named by some of the early navigators, and the open Bay of Tehuantepec, besides the smaller inlets of Acapulco and San Blas, forming two of the finest harbors in the world, and almost the only safe ones in the republic. On the east side the coast is mostly beset by lagoons and sand-banks, with no good havens, Campêche, Vera Cruz, Tampico, and Matamoros being all little better than open roadsteads exposed to the fierce "nortes," or northeasterly gales, that sweep the Gulf of Mexico for a great part of the year. Of headlands the most prominent are Capes S. Lucas and Palms at the south extremity of Lower California, Corrientes south from San Blas, and Catoche in the northeast of Yucatan. Besides this peninsula, which projects north-northeast, the only other is that of Lower California, which projects south-southeast parallel to the mainland. The islands are few in number, and all of insignificant size, the most noteworthy being Tiburon and Angel de la Guarda in the Gulf of California, the uninhabited Revillagigedo group in the Pacific, and Cozumel off the Yucatan coast. Mexico comprises all together twenty-seven confederate states, two territories, and the Federal District, with areas, populations, and chief towns as under:

States.	Sq. Miles	Pop. in 1900	Chief Towns.
NORTHERN—			
Sonora	76,900	220,553	Hermosillo.
Chihuahua	87,802	327,004	Chihuahua.
Coahuila	63,569	280,899	Saltillo.
Nuevo Leon	23,592	326,940	Monterey.
ATLANTIC—			
Tamaulipas	32,128	218,948	Ciudad Victoria.
Vera Cruz	29,201	960,570	Jalapa.
Tabasco	10,072	158,107	S. Juan Bautista.
Campeche	13,087	84,281	Campeche.
Yucatan	35,203	312,264	Merida.
PACIFIC—			
Sinaloa	33,671	296,109	Culiacan.
Jalisco	31,846	1,137,311	Guadalajara.
Colima	2,272	65,025	Colima.
Michoacan	22,874	935,439	Morelia.
Guerrero	24,996	474,594	Chilpancingo.
Oaxaca	34,382	947,910	Oaxaca.
Chiapas	27,222	363,607	San Christobal.
CENTRAL—			
Durango	38,009	371,274	Durango.
Zacatecas	24,757	462,886	Zacatecas.
Aguas Calientes	2,950	101,910	Aguas Calientes.
San Luis Potosi	25,316	582,486	San Luis Potosi.
Guanajuato	11,370	1,065,317	Guanajuato.
Queretaro	3,556	228,459	Queretaro.
Hidalgo	8,917	603,074	Pachuca.
Mexico	9,247	924,457	Toluca.
Morelos	2,773	161,697	Cuernavaca.
Puebla	12,704	1,024,446	Puebla.
Tlaxcala	1,595	172,217	Tlaxcala.
Federal District	463	540,478	Mexico.
Lower California	58,328	47,082	La Paz.
Tepic	11,275	149,677	Tepic.
Total	767,005	13,545,462	

Mexico forms a vast table-land, somewhat in the shape of a cornucopia, with its narrow end tapering to the south-southeast, its convex and concave sides facing the Pacific and Atlantic respectively, and with a general inclination northward. Most of the so-called Cordilleras are merely the "cumbres" or escarpments of this plateau, which falls abruptly toward the Atlantic, and through a series of well-marked terraces (formerly

lacustrine basins) toward the Pacific. Thus the carriage road from the capital runs in tolerably easy stages successively through the Tetla (8,000 feet), Mescala (5,500), Papagallo (1,800), and Peregrino (1,600) valleys down to Tepes within forty miles of the seaport of San Blas. But the southern central plateau of Anahuac maintains its mean elevation of 7,000 to 8,000 feet almost everywhere to within thirty-five to forty miles of the Atlantic. Hence the railway opened in 1872 between Vera Cruz and the capital has had to be carried by tremendously steep gradients to a height of nearly 8,000 feet within a total distance of 263 miles. The general but gradual northerly tilt of the table-land is shown by the altitudes of the capital, Durango, Chihuahua, and Paso del Norte on the United States frontier, which are respectively 7,600, 6,630, 4,600, and 3,800 feet.

The most continuous range is the Sierra Madre of the Pacific, which may be traced at a mean elevation of over 10,000 feet from Oajaca to Arizona, and which from Guadalajara to the northern frontier is crossed by no carriage route. Parallel to this is the Lower Californian range (Sierra de la Giganta, 3,000 feet), which, however, falls abruptly eastward, like the Atlantic escarpments. The Californian peninsula seems to have been detached from the mainland when the general upheaval took place which produced the vast chasm now flooded by the Gulf of California. Corresponding with the Sierra Madre of the Pacific on the west are the more interrupted eastern scarps of the central plateau, which sweep round the Gulf of Mexico as the Sierras Madras of Nuevo-Leon and Tamaulipas at an elevation of about 6,000 feet. These are crossed by the carriage routes from Tula to Tampico (highest pass 4,820 feet), from Saltillo to Monterey (3,400), and at several other points.

Of the central cross ridges the most important orographically and historically is the Cordillera de Anahuac which surrounds the Mexican (Tenochtitlan) and Puebla valleys, and which is supposed to culminate with Popocatepetl (17,853 feet) and Ixtacihuatl (15,705). East of Popocatepetl are Citlatepetl, better known as the Peak of Orizaba (17,176 feet), seventy miles inland, and San Martin or Tuxtla (9,708 feet) on the coast south of Vera Cruz, to which correspond on the west the recently upheaved Jorullo (4,000 feet) in Michoacan, Colima (12,800) near the coast in Jalisco, and the volcanic Revillagigedo group in the Pacific. South of this line, and nearly parallel, are the Sierras of Guerrero, and south of the Tehuantepec isthmus those of Oajaca and Soconusco toward the Guatemala frontier. In the same direction run the islands of Cuba and Hayti, which probably belong to the same Central-American system.

The rivers are almost useless for irrigation purposes, and available as means of communication only for short distances in their lower reaches, where they flow through the narrow alluvial strips of level coast-lands to the sea. Even the Rio Grande del Norte, which is by far the largest, and which forms the frontier line between Mexico and Texas, is navigable by large vessels only for a few miles above its port of Matamoras. The Rio Grande de Santiago, the largest on the Pacific side, is almost everywhere obstructed by falls and rapids. None of the lakes are of great size except Lake Chapala, which is traversed by the Rio Grande de Santiago, and has a reputed area of about 1,300 square miles.

In the higher ranges the prevailing formations are granites, which seem also to form the foundation of the plateaus, above which rise the traps, basalts, mineral-bearing porphyries, and more recent lavas. Igneous rocks of every geologic epoch certainly to a large extent form the superstructure of the central plateau.

Climate and Agriculture.—In the plateau region, or *tierras templadas*, the climate is almost that of perpetual spring, and the atmosphere remarkably free from moisture. It is to this peculiar dryness that the city of Mexico, the soil of which has been soaked with the filth of centuries, and never properly drained, owes its immunity from pestilence; but, on the other hand, throughout the plateau agriculture is dependent on the use and control of water for irrigation purposes, and an immense desert tract extends between Chihuahua and Zacatecas. Wood in all this upland region is scarce and dear, though there are valuable forests in the extreme north and south. On the coast-lands wood and water are abundant, and the soil fertile, but the climate is such that white men cannot work as laborers there. Yet Mexico contains as fine agricultural land as any in the world, and in most parts two crops a year are grown; while already a score of agricultural colonies, drawn from various nationalities, have been established in the country. Northern Mexico is the original home of the "cattle range" business, and there vast herds of horses, cattle and sheep form the principal wealth of the people. The coast belt and the terraces up to 3,000 feet constitute the *tierras calientes*, where the temperature ranges from 60° to 110° F., and, in the south at least, the magnificent tropical vegetation and the yellow fever and *vomito* reign with equal vigor. Two or three hours by the Vera Cruz Railway carries the traveler from Esperanza, at the very edge of the plateau, down into the heart of the tropics. The cold lands, or *tierras frias*, embrace all the country above 8,000 feet, including the few highest peaks covered with perpetual snow. South of about 28° N. there are only the wet and dry season, the former from June to October. Farther north there are four seasons; but in the highest zone the rainfall is very scanty, and northern Mexico and the Californian peninsula especially are exposed to seasons of drought. The vegetation of Mexico has the same wide range as the climate. In the lowlands dye-woods and valuable timbers abound in the virgin forests, as well as medicinal plants, india-rubber, palms, etc.; and oranges and bananas, many varieties of cactus, olives, sugar, coffee, cocoa, rice, indigo, cotton and tobacco, besides the omnipresent maize, all thrive. Many of these products, including the palms, oranges, cacti, olives, tobacco, and of course the maize, grow as readily over a great part of the temperate zone, where the characteristic vegetation embraces pines, evergreen oaks, the maguay or *Agave americana* and the henequen (*Agave sisilana*). The last two are nearly as frequent also in the *tierras frias*. The vine flourishes in some districts, especially near El Paso, Durango, and Parras in Coahuila, where a good wine is made; and mulberry plants have been imported from Europe to develop the silk industry. In Lower California a good deal of Archil is collected, and *chicle* gum is extracted and prepared in the forests along the coast. But agriculture in Mexico is very poorly developed. Primitive methods are followed by the people generally, and the American plow has only in a few localities displaced the crooked stick, sometimes shod with iron, and lashed by raw-hide thongs to the oxen's horns. There is, however, some agricultural machinery in use on the larger *haciendas*, or great landed estates. To their absentee owners such estates, in spite of the expense of irrigation and the shiftless methods in use, are said to return large incomes; but the difficulty and cost of transport are so great that in many parts of Mexico no more corn is grown than suffices to meet the wants of the immediate neighborhood. Of maize 128,222,000 bushels were raised in 1888. The other principal crops for the same year were wheat, 11,114,-

000 bushels; beans, 7,547,000 bushels; barley, 5,787,000 bushels. The value of the cotton crop averages \$9,000,000, of sugar cane \$7,000,000, of hemp and coffee above a third as much, and of tobacco a fourth. In 1889 henequen was exported from Yucatan to the value of over \$5,000,000.

Minerals.—Mexico is rich in minerals, many of which have been worked from an early date. Silver-mining, especially, has been an important industry ever since the conquest, and a considerable number of the mines are still worked at a profit. Gold, though to a greatly less value, is also produced. The coinage records, which date from 1537, and may be taken as substantially accurate, show the mintage of the precious metals from the year 1821 to 1900 to have been: Gold, \$5,285,530; silver, \$1,396,273,190—total, \$1,455,558,720. Copper is largely mined in some sections, being found in a pure state in Chiapas and Guanajuato, and elsewhere associated with gold. Other important minerals are iron, including enormous masses of meteoric iron ore, and the mountain a mile from Durango, the Cerro de Mercado, a solid mass of magnetic iron ore; lead, found associated with silver; and sulphur, zinc, quicksilver, platinum, cinnabar, asphalt and petroleum, besides salt, marble, alabaster, gypsum, and rock-salt in great quantities. There are also said to be large deposits of coal, some of excellent quality, in various localities; but as yet little of it has been mined. Throughout Mexico over 100,000 workmen are employed in the various mining enterprises—above 350 in number, and largely supported by American and British capital. Formerly the Mexican ores, especially argentiferous lead, were sent for smelting to the United States; but as the American tariff became prohibitive, establishments were set up on Mexican soil, to which in 1890 some American foundries and works also were transferred.

Manufactures and Trade.—In all Mexico the number of factories using steam power does not greatly exceed one hundred. Very little labor-saving machinery of any kind has been introduced, owing partly to the scarcity of fuel and water, and partly to the difficulty of repairing expensive and complicated machinery, usually—on the haciendas at any rate—broken on purpose by the peons, who are obstinately opposed to any change. In 1899 there were 118 cotton and 16 woolen factories in Mexico, besides 7 paper-mills and 2 potteries employing steam. Flour and unrefined sugar are also prepared, and a large sugar refinery was erected at Linares in 1890; while there are smaller special manufactures, such as candles, glass, porcelain; and the extraction of henequen fibre, too, is an important industry. Bounties are offered by some states for the establishment of factories within their bounds. But the handicraft production of such articles as pottery, saddles, sandals, many coarser textiles, the national hat, the sombrero, and the national drinks, pulque, mescal, and tequila, all from the various plants of the maguey family, is much more considerable. The great bulk of the Mexican exports is always formed by the precious metals—coin, bullion and ores; yet the amount of agricultural products and other merchandise has greatly increased since the construction of railways. Of these in 1860 there were none; in 1880 there were 655 miles, in 1902 over 9,600 miles open for traffic. The rapid construction of these lines, most of which are in English hands, has saddled the country with heavy responsibilities; the subventions payable to the several companies in the year 1890 amounted to \$3,500,000—about one-seventh of the government's total income—and the sum increases yearly, in accordance with agreements entered into with the companies. Moreover,

the spread of the railways has been made an excuse for the almost utter neglect of the roads, which throughout Mexico were bad enough before. The fine highways constructed by the Spaniards were allowed to fall into destruction during the long civil wars, and their present deplorable condition makes them rather a hindrance than a help in the development of the country. A still more serious obstacle to internal-commerce is the crushing system of interstate customs—the *alcabalas*—a heritage from the days of Spanish rule; they were abolished by a decree of 1886, but in 1890 the British minister reported that they still existed under various names in the territories and federal district, and in most of the states. Under the excise system, moreover, nearly every possible product, every branch of industry, every social function, even, is taxed; and a swarm of petty officials in every city, town and hamlet see that nothing escapes its tax, from a bag of seaweed or shavings to a funeral or fandango. In 1890 the fiscal *gendarmaria* alone cost four-fifths as much as the foreign office and the judicial power together. Still, in spite of these impediments, the trade of Mexico within recent years has steadily increased. During the period of 1896–1901 the imports advanced from \$42,204,095 to \$65,083,451, and merchant exports from \$45,553,389 to \$80,158,423. Of the exports in 1900 the precious metals represented \$71,025,024; henequen, coffee, hides, woods, tobacco, and vanilla came next. Nearly two-thirds of the total trade is with the United States, and one-fourth with Great Britain; France follows at some distance, and Germany yet further behind. Home manufactures and the distribution of merchandise are largely in the hands of foreigners. Of late years a large number of French merchants have settled in Mexico, and have nearly everywhere superseded the Germans, who controlled most of the trade from 1850 to 1870. In 1888 there were 12,300 French in the republic, and only 800 Germans, and the former had practically monopolized the dry-goods business of the country, and were pressing their rivals closely in other departments, such as hardware, in which the Germans had secured the lead. The entire foreign debt of Mexico was, in 1901, in gold, \$112,308,300. In the same year banking facilities were greatly extended, charters being granted for banks of issue and others in various towns; whereas previously banking had been confined almost entirely to two large banks at the capital, and their branches. In 1900 there were 42,843 miles of telegraphs and 4,349 of telephones.

Education has made marked progress since the final separation of church and state in 1857. In that year the old university of Mexico, a purely ecclesiastical institution after the model of Salamanca and the Sorbonne, was abolished, or rather was replaced by special schools of law, medicine, letters, agriculture, mines, sciences, fine arts, and commerce, and a military college. These, as well as numerous lower schools, including 200 in the capital alone, are all maintained by the state, while national schools are supported by public grants in all the large towns, and higher institutions in the capitals of the several states. There are in all nearly 5,000 public schools, besides establishments for the deaf and dumb, the blind, and juvenile delinquents, and numerous charitable foundations maintained by voluntary contributions.

Roman Catholicism, which under the Spanish rule was alone tolerated, continued after the separation to be the state religion until 1857. Since then, while all churches enjoy equal protection, none are officially recognized. The great majority of the *Indios fieles*, mestizos, and creoles still adhere, at least outwardly, to the Roman Church, which is administered by a hierarchy

rarchy of three archbishops (Mexico, Morelia, and Guadalajara) and twelve bishops. But by the organic laws of 1856 and 1859 all ecclesiastical estates, at one time comprising over one-third of the soil, were nationalized, the regular clergy suppressed, and their monasteries, together with all other superfluous ecclesiastical structures, appropriated by the state. During the last few years American Protestant missions have claimed some partial success, and the so-called "Church of Jesus," an undenominational body of a somewhat original type, has found a number of adherents, especially on the Anahuac table-land. But the *Indios bravos*, or uncivilized aborigines, everywhere follow the old spirit worship, while the Christianity of the Fideles is little more than a cloak for the continuous practice of the former Aztec heathenism.

Mexico constitutes at present a confederation of states modeled on that of the United States, and administered according to the constitution of 1857 as amended in 1873-74. By popular suffrage are chosen the president, the upper house (fifty-two members), and the supreme judiciary for four years, and the lower house (two hundred and twenty-seven members) for two years. The senate, abolished in 1853, was restored in 1874, the chief justice is *ex officio* vice president. The federal states, which are divided into a number of administrative districts, enjoy full autonomy in all local matters. The several constituencies are modeled on that of the central government, and like it comprise three departments—legislative, executive, and judicial. Each state is represented in the federal congress in the proportion of one member for every 80,000 inhabitants, and in the federal senate by two members elected by suffrage in the local congress. All external affairs and questions of general interest are reserved for the central government. The constitution as now established thus represents in theory the complete overthrow of mediævalism, and the absolute triumph of the new ideas which in the Old World are still in so many places struggling for the ascendancy.

Taking the whole population at less than 10,000,000, its ethnical distribution appears to be at present as under:—

1. Full-blood Indians.....	5,000,000
2. Mestizoes (half-caste Indians and whites).....	3,000,000
3. Creoles (whites of Spanish descent).....	1,500,000
4. Gachupines (Spaniards by birth).....	50,000
5. Other Europeans and Americans.....	100,000
6. Full-blood negroes.....	10,000
7. Zambos or "Chinos" (Indo-Africans).....	45,000
8. Muiattoes (Eurafricans).....	5,000

Under the Spanish administration, which was marked on the surface by few stirring events, such as warlike expeditions, civil strife, or serious internal troubles, Mexico, or New Spain, formed a viceroyalty at one time stretching from the isthmus of Panama to Vancouver's Island. Antonio de Mendoza, appointed in 1535 after government by *audiencias* had proved a signal failure, was the first of sixty-four viceroys who ruled with almost autocratic power, but scarcely any of whom has left a name in history.

But down to the early years of the present century all emoluments in church and state, most of the large plantations, of the mines, and of the commerce of the country, continued to be monopolized by the privileged gachupines, whom the creoles and mestizoes had already begun to regard as aliens. Hence the first reactionary movements, stimulated by Napoleon's deposition of King Ferdinand and arrest of the viceroy Hurregray in 1808, were aimed rather against odious class distinctions and the intolerable oppression of these aliens than against the abstract rights of the Spanish crown. The long smoldering spirit of discontent at

last broke into open revolt in 1810 at Guanajuato, under the leadership of Don Miguel Hidalgo. After his defeat and execution in 1811, the struggle was continued by Morelos, who, like Hidalgo, was a priest, and shared his fate in 1815. But he had already called a national assembly at Chilpanzinco, and by this body Mexican independence was for the first time proclaimed in 1813. A guerrilla warfare kept the national spirit alive till a fresh stimulus was given to it by the Spanish revolution of 1820. Under the leadership of the "Liberator" Iturbide, Mexican independence was again proclaimed on February 24, 1821, and the same year the capital was surrendered by O'Donoju, the last of the viceroys. But even after the revolt had thus been crowned with success a change of *personnel* rather than of system was contemplated; nor was Iturbide proclaimed emperor until the Mexican crown had been declined by a royal prince of Spain.

Almost simultaneously with this event the republican standard had been raised by Santa Anna at Vera Cruz (December, 1822). Thus the nation had no sooner got rid of foreign rule than it became torn by internal dissension. But henceforth the struggle is not so much against the privileged classes as between Conservative and Liberal principles—the former represented chiefly by the church and the superstitious populace, the latter by the more enlightened but not less unscrupulous sections of the community. From both the *Indios Bravos*, that is, about a third of the population, hold entirely aloof, and take advantage of the public disorders to continue their aggressive warfare against all alike. Events now follow in quick succession, and as many as 300 successful or abortive revolutions are recorded during the brief but stormy life of Mexican national independence. But amid the confusion of empires, republics, dictatorships, and military usurpations, succeeding each other with bewildering rapidity, the thoughtful student will still detect a steady progress toward the ultimate triumph of those Liberal ideas which lie at the base of true national freedom. A brief tabulated summary of the more salient incidents in this eventful struggle must here suffice:—

- 1821-23. Mexican independence acknowledged by Spain; regency under Iturbide, who (1822) is elected hereditary constitutional emperor; in December Santa Anna proclaims the republic in Vera Cruz.
- 1823-24. Provisional government; Iturbide abdicates; exiled, withdraws to London, but returning is shot (1824).
1824. First Liberal constitution—"Acta Constitutiva de la Federacion Mexicana," then comprising nineteen states and five territories; first president D. Felix Victoria, known as "Guadalupe Victoria."
- 1828-30. Contested presidencies of Pedraza, Guerrero, and Bustamante.
1835. Reaction of the church party; constitution of 1824 abolished; the confederate states fused in a consolidated republic under Santa Anna as president, but practically dictator.
1836. Texas, refusing to submit, secedes, defeats and captures Santa Anna.
1837. Santa Anna, returning, resumes office.
1839. Bravo's brief presidency followed by much anarchy.
- 1841-44. Santa Anna's first dictatorship with two others.
1844. Constitution restored with Santa Anna president; banished same year, he is succeeded by Canaltizo.
1845. Herrera president; disastrous war with United States to recover Texas.
1846. Santa Anna again president.

- 1848. Treaty of Guadalupe; California and New Mexico ceded to United States.
- 1853. Santa Anna's second dictatorship; treaty of Mesilla (negotiated by Gadsden), ceding extensive territory to United States and reducing Mexico to its present limits; great financial embarrassment; "Plan of Ayutla;" flight of Santa Anna followed by universal chaos.
- 1855. Provisional Government under President Comonfort.
- 1856. Constitutional convention; radical reforms; rupture with Spain.
- 1857. Liberal constitution of March 11th; suspended December 1st; Comonfort dictator; the reaction supported by the church, large part of the army, and all Conservatives; opposed at Vera Cruz by Vice-President Benito Juarez at the head of the "Puros" or advanced Liberals; the "War of Reform" begins, and lasts till 1860.
- 1858-59. In the capital Comonfort is deposed by Zuloaga, who abdicates in favor of Miramon, general of the Conservative forces; but, declining the presidency, Miramon restores Zuloaga; British legation violated; in Vera Cruz the United States envoy McLean acknowledges Juarez, who introduces further Liberal measures.
- 1860. Capitulation of Guadaluajara; flight of Miramon from the capital; triumph of the Liberals.
- 1861. Triumphant entry of Juarez into the capital; further radical reforms; marriage declared a civil contract; celibacy and ecclesiastical tribunals suppressed; confiscation of church property valued at £75,000,000 and over a third of the soil; final separation of church and state; Spain, France, and England urge claims for losses of their subjects resident in Mexico; convention of London; intervention of the allies, who occupy Vera Cruz in December.
- 1862. England and Spain withdraw, their claims having been settled by negotiation; war continued by France.
- 1863-64. The capital occupied by the French; Louis Napoleon dreams of a universal fusion of the Latin races; offers the Mexican imperial crown to the Austrian archduke Ferdinand Maximilian, who accepts, and arrives in June, 1864.
- 1867. After diverse issues the French withdraw; Maximilian abandoned to his fate, is captured and shot at Querétaro (June 19th).
- 1867-69. Various pronunciamientos by Santa Anna and others.
- 1871-72. Juarez president; he dies in office July, 1872; succeeded by his secretary, Lerdo de Tejada.
- 1873-74. The Liberal constitution of 1857, which had been twice suspended (1858-60 and 1863-67), is now largely amended, and continues to be henceforth the organic law of Mexico.
- 1876. Tejada succeeded by Porfirio Diaz.
- 1880. Manuel Gonzalez, president.
- 1884. Diaz again president.
- 1888-1900. Diaz reelected (now serving his sixth term).

THE CITY OF MEXICO.

Mexico, the capital formerly of the Aztec empire and of the Spanish colony of New Spain, and now of the republic, state, and federal district of Mexico, stands on the Anahuac plateau, 7,524 feet above sea-level, two and a half miles from the southwest side of Lake Tezcuco (Texcoco), the lowest and largest of six basins filling the deepest depression in the hill-circled Mexican valley. It is 173 miles by rail from Vera Cruz on

the Atlantic, 290 from Acapulco on the Pacific, 285 from Oajaca, 863 from Matamoras on the United States frontier. Mexico is the largest and finest city in Spanish America, forming a square nearly three miles both ways, and laid out with perfect regularity, all its 600 streets and lanes running at right angles north to south and east to west, and covering within the walls an area of about ten square miles, with a population (in 1895) of 329,774. Most of the inhabitants are pure-blood Indians or mestizoes; but the foreigners, chiefly French, English, Germans, Americans, and Spaniards, monopolize nearly all the trade, and as capitalists, bankers, merchants, and dealers, enjoy an influence out of all proportion to their numbers. A large portion of the natives are mendicants or vagrants, and the distinctly criminal element (26,470 in 1878) is kept in order by a police force of 1,320 men; and yet in that year there were as many as 5,370 knife-attacks and 3,250 robberies. The broad, well-paved, and gas-lit streets present a picturesque appearance with their quaint two and three storied stone houses gayly painted in white, red, yellow, or green, and terminating everywhere with a background of rugged sierras or snowy peaks which, owing to the bright atmosphere at this elevation, seem quite close, although really thirty or forty miles distant. All the main thoroughfares converge on the central Plaza de Armas (Plaza Mayor, or Main Square), which covers fourteen acres, and is tastefully laid out with shady trees, garden plots, marble fountains, and seats. Here also are grouped most of the public buildings, towering above which is the cathedral, the largest and most sumptuous church in America, which faces the north side of the plaza on the site of the great pyramidal Teocalli or temple of Huitzilopochtli, titular god of the Aztecs.

The east side of the plaza is occupied by the old viceregal residence, now the National Palace, with 675 feet frontage, containing most of the government offices (ministerial, cabinet, treasury), military headquarters, archives, meteorological department, with observatory, and the spacious hall of ambassadors with some remarkable paintings by Miranda and native artists. North of the National Palace, and apparently forming part of it, are the postoffice and the national museum of natural history and antiquities, with a priceless collection of Mexican remains. Close to the cathedral stands the Monte de Piedad, or national pawnshop, a useful institution, endowed in 1744 by Terreros with \$375,000, and now possessing nearly \$10,000,000 of accumulated funds. Facing the cathedral is the Palacio Municipal (city hall), 252 feet by 122, rebuilt in 1792 at a cost of \$150,000, and containing the city and district offices, the corporation jail, and the lonja, or merchants' exchange. Around the Plaza San Domingo are grouped the convent of that name, said to contain vast treasures buried within its walls, the old inquisition, now the school of medicine, and the custom-house. In the same neighborhood are the church of the Jesuits and the school of arts, an immense workshop, including iron and brass foundries, carriage and cart mending, building and masonry, various branches of joinery and upholstery work, and silk and cotton hand-weaving. Other noteworthy buildings are the national picture gallery of San Carlos, the finest in America, in which the Florentine and Flemish schools are well represented, and which contains the famous Las Casas, by Felix Parra; the national library of St. Augustine, with over 100,000 volumes, numerous MSS., and many rare old Spanish books; the mint, which since 1690 has issued coinage, chiefly silver, to the amount of nearly \$2,000,000,000; the Iturbide hotel, formerly the residence of the emperor Iturbide; the Minería, or school of mines, with lecture-rooms, laborato-

ries, rich mineralogical and geological specimens, and a fossil horse three feet high of the Pleistocene period. Owing to the spongy nature of the soil, the Minería and many other structures have settled out of the perpendicular, thus often presenting irregular lines and a rickety appearance. Among the twenty scientific institutes, mention should be made of the Geographical and Statistical Society, whose meteorological department issues charts and maps of unsurpassed excellence.

Before 1860 half of the city consisted of churches, convents, and other ecclesiastical structures, most of which have been sequestered and converted into libraries, stores, warehouses, and even stables, or pulled down for civic improvements. Nevertheless there still remain fourteen parishes and thirty other churches, some of large size, with towers and domes, and their number has now been increased by six Protestant churches, including the Anglican cathedral in San Francisco street. This is the leading thoroughfare, and is rivaled in splendor only by the new Cinco de Mayo street, running from the National theater to the cathedral.

The city is supplied by two monumental aqueducts, from Chapultepec and the southwest, with good water at the rate of forty-four gallons per day per inhabitant.

Its industries are varied but unimportant, consisting chiefly of gold and silver work, coarse glazed and unglazed pottery of peculiar form and ornamentation, paper, leather-work remarkable for its taste and beautiful designs, toys, rosaries, crucifixes, religious pictures, lace and some weaving.

Mexico enjoys an equable climate, with a temperature varying from 70° to 50° F., but rendered unhealthy by the exhalations from the lakes and bad drainage. The chief public promenades are the Alameda, planted with stately beeches; the Vega, skirted by the Vega Canal, and adorned with the colossal bust of Guatemozin, the last of the Aztec emperors; the Paseo de la Riforma, a fine avenue three miles long, running south to the famous castle of Chapultepec, a place intimately associated with the names of both Montezuma and Maximilian.

Mexico dates either from the year 1325 or 1327, when the Aztecs, after long wanderings over the plateau, were directed by the oracle to settle at this spot. For here had been witnessed the auspicious omen of an eagle perched on a nopal (cactus) and devouring a snake. Hence the original name of the city, Tenochtitlan (nopal on a stone), changed afterward to Mexico in honor of the war god Mexitli. The city had reached its highest splendor on the arrival of the Spaniards in 1519, when it comprised from 50,000 to 60,000 houses, with perhaps 500,000 inhabitants, and seemed to Cortes "like a thing of fairy creation rather than the work of mortal hands."

MEXICO, a Missouri town, the capital of Audrain county, is a railroad center of considerable importance. It has banks, telegraphs, churches, schools, a high school, and a female college. A woolen factory and a plow factory are also located here. Population (1900), 5,009.

MEYERBEER, GIACOMO, musical composer, first known in Germany as Jakob Meyer Beer, was born at Berlin on September 5, 1791, of a wealthy and talented Jewish family. His early works were far from successful—his first opera, *Jephtha's Gelübde*, failing lamentably at Darmstadt in 1811, and his second, *Wirth und Gast (Almelek)*, at Vienna in 1814. At Venice he was so captivated by the style of Rossini that, renouncing all thought of originality, he produced a succession of seven Italian operas—*Romilda e Costanza*, *Semiramide riconosciuta*, *Edonardo e Cristina*, *Emma di Rosburgo*, *Margherita d'Anjou*, *L'Esule di Granata*, and *Il Crociato*

in Egitto—which all achieved a success as brilliant as it was unexpected. For several years after this he produced nothing in public; but, in concert with Scribe, he planned the work which first made known the reality of his transcendent genius—his first French opera, *Robert le Diable*. This gorgeous drama was produced at the Grand Opéra in 1831, and received with acclamation. Its popularity exceeded all previous expectation; yet for five years after this signal triumph Meyerbeer appeared before the public no more. In some respects his next opera, *Les Huguenots*, was greater, though it fell short of the deep romance which rendered *Robert le Diable* so incomparably captivating.

The first performance of *Les Huguenots* took place in 1836. After the production of *Les Huguenots* Meyerbeer again retired from public view, and spent many years in the preparation of two of his greatest works—the greatest of all except the two we have already mentioned—*L'Africaine* and *Le Prophète*. The libretti of both these operas were furnished by Scribe; and both were subjected to countless changes of detail before they satisfied the composer's fastidious taste; in fact, the story of *L'Africaine* was more than once entirely rewritten.

Meanwhile Meyerbeer accepted the appointment of kapellmeister to the king of Prussia, and spent some years at Berlin, where he produced *Ein Feldlager in Schlesien*, a German opera, in which the matchless cantatrice Jenny Lind made her first appearance in Prussia, with unprecedented success. Here also he composed, in 1846, the overture to his brother Michael's drama, *Struensee*. But his chief care at this period was bestowed upon the worthy presentation of the works of others. He began by presenting his dead friend Weber's *Euryanthe*, with scrupulous attention to the composer's original idea. With equal unselfishness he procured the acceptance of *Rienzi* and *Der Fliegende Holländer*, the first two operas of Richard Wagner, who, then languishing in poverty and exile, would, but for him, have found it impossible to obtain a hearing in Berlin. With Jenny Lind as prima donna and Meyerbeer as conductor, the opera flourished brilliantly in the Prussian capital; but the anxieties of this thankless period materially shortened the composer's life.

In 1854 he brought out *L'Étoile du Nord* at the Opéra Comique, and in 1859 *Le Pardon de Ploermel (Dinorah)*. His last great work, *L'Africaine*, was in active preparation at the Académie, when, on April 23, 1863, he was seized with a sudden illness, of which he died on May 2d.

MÉZIÈRES, a fortress of the first class, and the capital of the department of Ardennes, France, is 161 miles to the northeast of Paris by railway, on a peninsula of the Meuse, which almost entirely surrounds the town, and separates it from its more important suburb, Charleville.

MEZŐ-TÚR, a corporate town in the Cis-Tisian county of Jász-Nagy-Kun-Szolnok, Hungary, situated on the right bank of the Berettyó, and on the railway from Arad to Szolnok. In 1900 the population was about 22,649, mostly Magyars by nationality.

MEZZOFANTI, GIUSEPPE, cardinal, whose colloquial linguistic acquirements have become proverbial, was born September 17, 1774, at Bologna. He died at Rome, during the absence of the pontifical court at Gaeta, on March 15, 1849.

MEZZOTINT. See ENGRAVING.

MIAUTSE. The Miautse or Meao-tse of southern China are one of the aboriginal tribes of the country. At one time they occupied a considerable portion of the rich and fertile lands which now form the central province of the empire, but as the Chinese advanced

southward they were driven, like the Ainos in Japan and the Welsh in Britain, into the more inaccessible districts until they were compelled to seek refuge from the invaders in the mountain ranges, in the provinces of Yunnan, Kwei-chow, Kwang-se, and Kwang-tung, where they are found at the present day. In figure the Miautse, both men and women, are shorter and darker-complexioned than the Chinese, their faces also are rounder, and their features sharper. In disposition, too, they are very unlike their civilized neighbors. They are brave, passionate, suspicious, revengeful, and indifferent to cold and hunger; they are free and easy in their manners, and are as noisily joyous as the Chinese are grave and sedate.

MICAH (מִיכָה) is the short form of a name which in various modifications—*Micāiahū*, *Micāiāhū*, *Micāiāh*—is common in the Old Testament, expressing as it does a fundamental point of Hebrew faith: Who is like Jehovah? The name was borne among others by the Danite whose history is given in Judges, xvii. *sq.*, by the prophet who opposed Ahab's expedition to Ramoth-Gilead, and by the subject of the present article, the contemporary and fellow-worker of Isaiah, whose name is prefixed to the sixth in order of the books of the minor prophets. He, it would appear from his writings, lived in the shephela or Judæan lowlands.

MICHAEL (מִיכָאֵל, "who is like God?") appears in the Old Testament as a man's name, synonymous with Micaiah or Micah. In the book of Daniel the same name is given to one of the chief "princes" of the heavenly host, the guardian angel or "prince" of Israel, and as such he naturally appears in Jewish theosophy as the greatest of all angels, the first of the four who surrounded the throne of God (see GABRIEL). It is as guardian angel of Israel, or of the church, the true Israel, that Michael appears in Jude 9 and Rev. xii. 7. In the Western Church the festival of St. Michael and All Angels (Michaelmas) is celebrated on September 29th.

MICHAEL, the name of several Byzantine emperors.

MICHAEL I. (Rhagabé) was an obscure nobleman who had married Procopia, the daughter of Nicephorus I., and been made master of the palace; his elevation to the throne was due to a revolutionary movement against his brother-in-law Stauracius, who reigned only two months after the death of Nicephorus on the battlefield (812). He died in 845.

MICHAEL II. (The Stammerer), a native of Amorium in Phrygia, was of humble origin, and began life as a private soldier, but rose by his talents and assiduity to the rank of general. He was one of those who had favored the election to the throne of his old companion in arms, Leo the Armenian, in 813, but, detected in a conspiracy against the government of that emperor, had been sentenced to death in December, 820; his partisans, however, succeeded in assassinating Leo on the morning of Christmas Day, and called Michael from the prison to the throne. He died in October, 829, and was succeeded by Theophilus, his son.

MICHAEL III. (The Drunkard) was the grandson of Michael the Stammerer, and succeeded his father Theophilus when only three years of age (842). Michael was assassinated in his palace in 867 by Basilus the Macedonian, whom he had associated with himself in the empire in the previous year.

MICHAEL IV. (The Paphlagonian) owed his elevation to Zoe, daughter of Constantine IX., the last of the Macedonian dynasty; this princess was married to Romanus III., but becoming enamored of Michael,

her chamberlain, she poisoned her husband and married her attendant (1034). He died on December 10, 1041.

MICHAEL V. (Calaphates or The Calker), nephew and successor of the preceding, derived his surname from his father Stephen, who had originally followed the occupation of a calker of ships. He owed his elevation (December, 1041) to his uncle John, whom along with Zoe he almost immediately banished; this led to a popular tumult and his dethronement after a brief reign of four months (April, 1042).

MICHAEL VI. (The Warlike) was already an old man when chosen by the empress Theodora as her successor shortly before her death in 1056. His government was feeble in the extreme, and he was at last compelled to abdicate by Isaac Comnenus, who had defeated his army in Phrygia (August, 1057).

MICHAEL VII. (Ducas or Parapinaces) was the eldest son of Constantine XI. Ducas, by whom, along with his brothers Andronicus I. and Constantine XII., he was invested with the title of Augustus; this joint succession took place in 1067, but in 1071 it suited the policy of the uncle Joannes Cæsar to make Michael sole emperor.

MICHAEL VIII. (Palæologus), born in 1234, was the son of Andronicus Palæologus Comnenus and Irene Angela, the granddaughter of Alexius Angelus, emperor of Constantinople. At an early age he rose to distinction, and ultimately became commander of the French mercenaries in the employment of the emperors of Nicea. A few days after the death of Theodore Lascaris II. in 1259, Michael, by the assassination of Muzalon, succeeded to the guardianship, shared with the patriarch Arsenius, of the young emperor John Lascaris, then a lad of only eight years. Afterward invested with the title of "despot," he was finally proclaimed joint-emperor, and crowned alone at Nicea on January 1, 1260. He died in Thrace, in December, 1282, and was succeeded by his son, Andronicus II.

MICHAEL IX. (Palæologus) was the son of Andronicus II., and was associated with him on the throne from 1295, but died before him (1320).

MICHAELIS, JOHANN DAVID, one of the most influential scholars and teachers of last century, belonged to a family which had the chief part in maintaining that solid discipline in Hebrew and the cognate languages which distinguished the university of Halle in the period of Pietism. He was born in 1717, and died in 1791.

MICHAUD, JOSEPH, French historian and publicist, was born of an old family on June 19, 1767, at Albens, Savoy. In 1791 he went to Paris, where, not without danger, he took part in editing several royalist journals. In 1794 he started *La Quotidienne*. Along with his brother and two colleagues he published in 1806 a *Biographie moderne, ou dictionnaire des hommes qui se sont fait un nom en Europe depuis 1789*, the earliest work of its kind; in 1808 the first volume of his *Histoire des Croisades* appeared, and in 1811 he originated the *Biographie Universelle*. In 1814 he resumed the editorship of the *Quotidienne*, and in the same year was elected Academician. In 1815 his brochure entitled *Histoire des quinze Semaines ou le dernier règne de Bonaparte* met with extraordinary success. In 1830–31 he traveled in Syria and Egypt for the purpose of collecting additional materials for the *Histoire des Croisades*. The *Bibliothèque des Croisades*, in four volumes more, contained the "pièces justificatives" of the *Histoire*. Michaud died on September 30, 1839, at Passy, where his home had been since 1832.

MICHAUX, ANDRÉ, a French botanist, best known for his works on the flora of North America and as a botanical traveler, was born in 1746 and died in 1802.

MICHAUX, FRANÇOIS ANDRÉ, born 1770 and died 1855, son of the preceding, was, like his father, em-

played by the French Government to explore the forests of North America with a view to the introduction into France of trees valuable for their wood or other products. He was very successful in carrying out this object.

MICHELANGELO, Michelangelo Buonarroti, best known simply as Michelangelo, the last and most famous of the great artists of Florence, was the son of Ludovico Buonarroti, a poor gentleman of that city, and on March 6, 1475, the second son, Michelagnolo, or Michelangelo, was born. While still a young boy, Michelangelo determined, in spite of his father's opposition, to be an artist. He had sucked in the passion, as he himself used to say, with his foster-mother's milk.

Though Michelangelo's earliest studies were directed toward painting, he was by nature and predilection much more inclined to sculpture. In that art he presently received encouragement and training under the eye of an illustrious patron, Lorenzo dei Medici.

Michelangelo had been attached to the school and household of the Medici for barely three years when, in 1492, his great patron Lorenzo died. Lorenzo's son Piero dei Medici inherited the position, but not the qualities, of his father; Florence soon chafed under his authority; and toward the autumn of 1494 it became apparent that disaster was impending over him and his adherents. Michelangelo was constitutionally subject to dark and sudden presentiments; one such seized him now, and, without awaiting the popular outbreak which soon followed, he took horse with two companions and fled to Bologna. There, being now in his twentieth year, he was received with kindness by a member of the Aldovrandi family, and on his commission executed two figures of saints, and one of an angel, for the shrine of St. Dominic in the church of St. Petronius. After about a year, work at Bologna failing, and his name having been included in his absence on the list of artists appointed to provide a new hall of assembly for the Great Council of Florence, Michelangelo returned home. Michelangelo was not left without employment. He found a friend in another Lorenzo, the son of Pierfrancesco dei Medici, for whom he at this time executed a statue of the boy St. John. He set out for Rome for the first time at the end of June, 1496.

Michelangelo's stay in Rome at this time lasted five years, from the summer of 1496 till that of 1501. Having after an illness, come home in the latter year, Michelangelo received the request from the cardinal Francesco Piccolomini to adorn with a number of sculptured figures a shrine already begun in the cathedral of Siena in honor of the most distinguished member of his house, Pope Pius II. Four only of these figures were ever executed, and those not apparently, or only in small part, by the master's hand. A work of greater interest in Florence itself had diverted him from his engagement to his Sienese patron. This was the execution of the famous colossal statue of David, popularly known as the Giant. It was carved out of a huge block of marble on which another sculptor, Agostino d'Antonio, had begun unsuccessfully to work forty years before, and which had been lying idle ever since. Michelangelo had here a difficult problem before him. Without much regard to tradition or the historical character of his hero, he carved out of the vast but cramped mass of material a youthful, frowning colossus, which amazed every beholder by its freedom and science of execution, and its victorious energy of expression. All the best artists of Florence were called in council to determine on what site it should be set up, and after much debate the terrace of the Palace of the Signory was chosen, in preference to the neighboring Loggia dei Lanzi. Here, accordingly, the colossal David of Michelangelo took, in the month

of May, 1504, the place which it continued to hold ever afterward, until some years ago, in 1873, it was removed for the sake of protection to a hall in the Academy of Fine Arts. Other works of sculpture by the same indomitable hand also belong to this period.

Neither was Michelangelo idle at the same time as a painter. Leaving disputed works out of sight, he, in these days at any rate, painted for his and Raphael's common patron, Angelo Doni, the *Holy Family* now in, the Uffizi at Florence. And in the autumn of 1504, the year of the completion of the David, he received from the Florentine state a commission for a work of monumental painting on an heroic scale. Leonardo da Vinci had been for some months engaged on his great cartoon of the battle of Anghiari, to be painted on the wall of the great hall of the municipal council. The gonfaloniere Soderini now procured for Michelangelo the commission to design a companion work. Michelangelo chose an incident of the Pisan war, when the Florentine soldiery had been surprised by the enemy in the act of bathing; he dashed at the task with his accustomed fiery energy, and had carried a great part of the cartoon to completion when, in the early spring of 1505, he broke off the work in order to obey a call to Rome which reached him from Pope Julius II.

Michelangelo had not been long in the Eternal City before his new patron devised fit employment for him. That capacious and headstrong spirit, on fire with great enterprises, had conceived the idea of a sepulchral monument to commemorate his glory when he should be dead, and to be executed according to his own plans while he was still living. He intrusted this congenial task to Michelangelo. The design being approved, the artist spent the winter of 1505-6 at the quarries of Carrara, superintending the excavation and shipment of the necessary marbles. In the spring he returned to Rome, and when the marbles arrived fell to with all his energy at the preparations for the work. For awhile the pope followed their progress eagerly, and was all kindness to the young sculptor. But presently his disposition changed. In Michelangelo's absence an artist who was no friend of his, Bramante of Urbino, had been selected by Julius to carry out a new architectural scheme, commensurate with the usual vastness of his conceptions, namely, the rebuilding of St. Peter's church. To the influence and the malice of Bramante, Michelangelo attributed the unwelcome invitation he now received to interrupt the great work of sculpture which he had just begun, in order to decorate the Sixtine chapel with frescoes. Convinced that not his employment only, but his life, was threatened, he suddenly took horse and left Rome, and before the messengers of the pope could overtake him was safe on Florentine territory. Michelangelo's flight took place in April, 1506. Once among his own people, he turned a deaf ear to all overtures made from Rome for his return, and stayed throughout the summer at Florence.

During the same summer Julius planned and executed the victorious military campaign which ended in his unopposed entry at the head of his army into Bologna. Thither, under strict safe-conduct and promises of renewed favor, Michelangelo was at last prevailed on to betake himself. Julius received the truant artist kindly, as indeed between these two volcanic natures there existed a natural affinity, and ordered of him his own colossal likeness in bronze, to be set up, as a symbol of his conquering authority, over the principal entrance of the church of St. Petronius. Three years later it was destroyed in a revolution. The people of Bologna rose against the authority of Julius; his delegates and partisans were cast out, and his effigy hurled from its place. The work of Michelangelo, after being trailed in

derision through the streets, was broken up and its fragments cast into the furnace.

Meanwhile the artist himself, as soon as his work was done, had followed his reconciled master back to Rome. The task that here awaited him, however, was after all not the resumption of the papal monument, but the execution of the series of paintings in the Sistine chapel which had been mooted before his departure. Michelangelo's plan was accepted by the pope, and by May, 1503, his preparations for its execution were made. The physical conditions of prolonged work, face upward, upon this vast expanse of ceiling, were adverse and trying in the extreme. But after four and a half years of toil the task was accomplished. Once, during the progress of his task Michelangelo was compelled to remove a portion of the scaffolding and exhibit what had been so far done, when the effect alike upon friends and detractors was overwhelming. Still more complete was his triumph when, late in the autumn of 1512, the whole of his vast achievement was disclosed to view.

The Sistine chapel was no sooner completed than Michelangelo resumed work upon the marbles for the monument of Julius. But four months only had passed when Julius died. His heirs immediately entered (in the summer of 1513) into a new contract with Michelangelo for the execution of the monument on a reduced scale. The entire work was to be completed in nine years' time. During the next three years, it would seem, Michelangelo brought to completion three at least of the promised figures, and they are among the most famous of all existing works of the sculptor's art—namely, the Moses now in the church of S. Pietro in Vincoli at Rome and the two "Slaves" at the Louvre.

Julius II. had been succeeded on the papal throne by a Medici under the title of Leo X. Leo X. and his kinsmen insisted that Michelangelo, regardless of all other engagements, must design and carry out a great new scheme for the enrichment of their own family church of San Lorenzo in Florence. Unwillingly Michelangelo accepted the new commission thus thrust upon him for the church façade at Florence; but, having once accepted it, he produced a design of combined sculpture and architecture as splendid and ambitious in its way as had been that for the monument of Julius. In the summer of 1516 he left Rome for Carrara to superintend the excavation of the marbles.

When all was well in progress there under his own eye, reasons of state induced the Medici and the Florentine magistracy to bid him resort instead to certain new quarries at Pietrasanta, near Serravalle, in the territory of Florence. Presently he found himself so impeded and enraged by the mechanical difficulties of raising and transporting the marbles, and by the disloyalty and incompetence of those with whom he had to deal, that he was fain to throw up the commission altogether. The contracts for the façade of San Lorenzo were rescinded in March, 1518, and the whole magnificent scheme came to nothing. Michelangelo then returned to Florence, where proposals of work poured in on him from many quarters. He complied with none of these requests.

The next twelve years of Michelangelo's life (1522-34) were spent at Florence, and again employed principally in the service of his capricious and uncongenial patrons, the Medici. The plan of a great group of monuments to deceased members of this family, to be set up in their mortuary chapel in San Lorenzo, seems to have been formed, and preparations to have been made by Michelangelo for its execution, as early as 1519. It was not, however, until 1524, after Leo X. had died, and his successor, Adrian VI., had been in his turn succeeded by another Medicean pope, Clem-

ent VII., that any practical impulse was given to the work. In 1527 came to pass the sack of Rome by the Austrians, and the apparent irretrievable ruin of Pope Clement. The Florentines seized the occasion to expel the Medici from their city, and set up a free republican government once more. Soon Michelangelo was called to help in defending the city itself from danger. In view of an approaching siege, he was appointed engineer-in-chief of the fortifications. He spent the early summer of 1529 in strengthening the defenses of San Miniato; from July to September he was absent on a diplomatic mission to Ferrara and Venice. Returning in the middle of the latter month, he found the cause of Florence hopeless from internal treachery and from the overwhelming strength of her enemies. One of his dark seizures overcame him, and he departed again suddenly for Venice. Not cowardice, but despair of his city's liberties, and still more of his own professional prospects amid the turmoil of Italian affairs, was the motive of his departure. For awhile he remained in Venice, negotiating for a future residence in France. Then, while the siege was still in progress, he returned once more to Florence; but in the final death-struggle of her liberties he bore no part. When, in 1530, the city submitted to her conquerors, no mercy was shown to most of those who had taken part in her defense. Michelangelo believed himself in danger with the rest, but on the intervention of Baccio Valori he was presently taken back into favor and employment by Pope Clement. For three years more he still remained at Florence, engaged principally on the completion of the Medici monuments, and on the continuance of the Medicean library, but partly also on a picture of Leda for the duke of Ferrara.

Clement insisted that Michelangelo must complete his decorations of the Sistine chapel by painting anew the great end wall above the altar, adorned until then by frescoes of Perugino. The subject chosen was the *Last Judgment*, and Michelangelo began to prepare sketches. For the next two years he lived between Rome and Florence, and in the autumn of 1534, in his sixtieth year, settled finally and for the remainder of his life at Rome. Immediately afterward Pope Clement died, and was succeeded by a Farnese under the title of Paul III. Even more than his predecessor, Paul insisted on claiming the main services of Michelangelo for himself, and forced him to let all other engagements drift. For the first seven years after the artist's return to Rome, his time was principally taken up with the painting of the colossal and multitudinous *Last Judgment*. This being completed in 1541, he was next compelled to undertake two more great frescoes, one of the Conversion of Paul and another of the Martyrdom of Peter, in a new chapel which the pope had caused to be built in the Vatican, and named after himself *Capella Paolina*.

During the fifteen years (1534-49) when Michelangelo was mainly engaged on these paintings, he had also at last been enabled to acquit himself, although in a manner that can have been satisfactory to none concerned, of his engagements to the heirs of Julius. It was agreed that the Moses executed thirty years ago should be the central figure of the new scheme; assistants were employed to carve two smaller flanking figures of female personifications; and the three were in 1545 set up in S. Pietro in Vincoli in combination with an architectural structure of rich but incongruous design. During the same years the long-pent human elements of fervor and tenderness in Michelangelo's nature had found vent and utterance such as they had never found before. He had occasionally practiced poetry in his youth, and there are signs of some transient levee-passage during his

life at Bologna. But it was not until toward his sixtieth year that the springs of feeling were fairly opened in the heart of this solitary, this masterful and stern, life-wearied and labor-hardened man. Toward that age we find him beginning to address impassioned sonnets, of which the sentiment is curiously comparable to that expressed in some of Shakespeare's, to a beautiful and gifted youth, Tommaso Cavalieri. Soon afterward he made the acquaintance of the pious, accomplished, and high-souled lady, Vittoria Colonna, widow of the Marquis Pescara. For twelve years, until her death, which happened in 1547, her friendship was the great solace of Michelangelo's life. On her, in all loyalty and reverence, he poured out all the treasures of his mind, and all his imprisoned powers of tenderness and devotion. He painted for her a crucifixion of extraordinary beauty, of which many imitations but not the original have come down to us. She was the chief inspirer of his poetry—in which, along with her praises, the main themes are the Christian religion, the joys of Platonic love, and the power and mysteries of art. Michelangelo's poetical style is strenuous and concentrated like the man. He wrote with labor and much self-correction; we seem to feel him flinging himself on the material of language with the same overwhelming energy and vehemence—the same impetuosity of temperament, combined with the same fierce desire of perfection—with which contemporaries describe him as flinging himself on the material of marble.

And so the mighty sculptor, painter, and poet reached old age. An infirmity which settled on him in 1544, and the death of Vittoria Colonna in 1547, left him broken in health and heart. But his strength held on for many a year longer yet. During the last years of his life he made but few more essays in sculpture, and those not successful, but was much employed in the fourth art, in which he excelled, that of architecture. A succession of popes demanded his services for the embellishment of Rome. For Paul III. he built the palace called, after the name of the pope's family, the Farnese. On the death of Antonio da San Gallo he succeeded to the onerous and coveted office of chief architect of St. Peter's Church, for which he remodeled all the designs, living to see some of the main features, including the supports and lower portion of the great central dome, carried out, in spite of all obstacles, according to his plans. Other great architectural tasks on which he was engaged were the conversion of a portion of the Baths of Diocletian into the church of Sta Maria degli Angeli, and the embellishment and rearrangement of the great group of buildings on the Roman Capitol. At length, in the midst of these vast schemes and responsibilities, the heroic old man's last remains of strength gave way. He died on the threshold of his ninetieth year, on February 18, 1564.

MICHELET, JULES, one of the most voluminous and remarkable writers of France, and one who only lacked a keener power of self-criticism to make him one of the greatest, was born at Paris, August 21, 1798. Between 1825 and 1827 he produced divers sketches, chronological tables, etc., of modern history. Four years later, in 1831, the *Introduction à l'Histoire Universelle* showed a very different style. Very soon afterward he began his chief and monumental work, the *Histoire de France*, which occupied him for about forty years. But he accompanied this with numerous other works, chiefly of erudition, such as the *Œuvres Choisies de Vico*, the *Mémoires de Luther écrits par lui-même*, the *Origines du Droit Français*, and somewhat later the *Procès des Templiers*. He published, in 1839, a *History of the Roman Republic*, but this was in his graver and earlier manner. The results of his lectures

appeared in the volumes *Le Prêtre, la Femme, et la Famille* and *Le Peuple*.

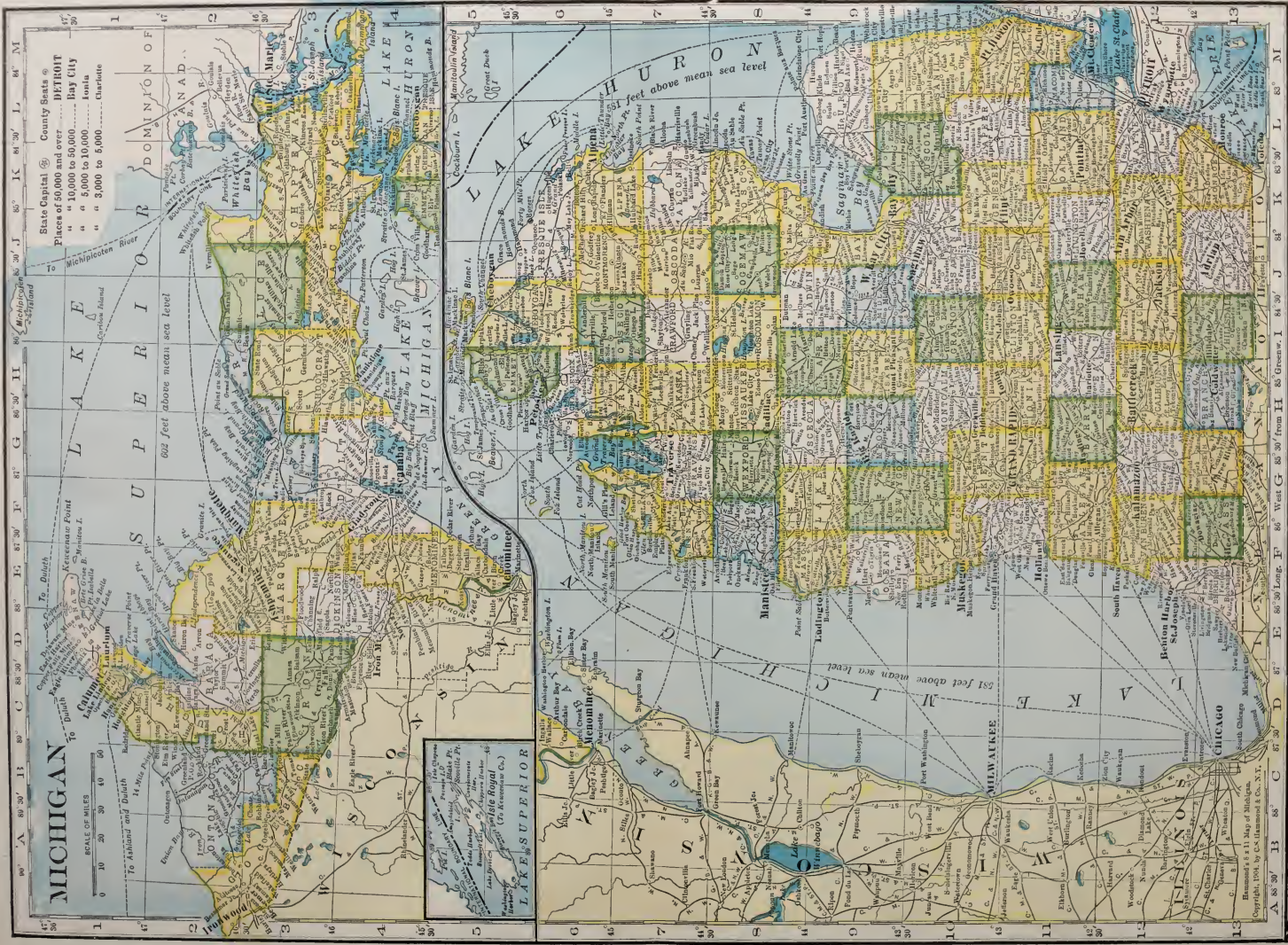
Besides continuing the great history, he undertook and carried out, during the years between the downfall of Louis Philippe and the final establishment of Napoleon III., an enthusiastic *Histoire de la Révolution Française*. While the history steadily held its way, a crowd of extraordinary little books accompanied and diversified it. The first of these (by no means the best) was *Les Femmes de la Révolution* (1854). In the next, *L'Oiseau* (1856), a new and most successful vein was struck. *L'Insecte*, in the same key, but duller, followed. It was succeeded by *L'Amour* (1859). *L'Amour* was followed by *La Femme* (1860). Then came *La Mer* (1861). The next year (1862) the most striking of all Michelet's minor works, *La Sorcière*, made its appearance. The ambitious *Bible de l'Humanité* (1864), an historical sketch of religion, has but little merit. In *La Montagne* (1868), *Nos Fils* (1869), *Le Banquet*, *Les Soldats de la Révolution*, and *Légendes Démocratiques du Nord* we have a remarkable exhibit.

Uncompromisingly hostile as Michelet was to the empire, its downfall and the accompanying disasters of the country once more stimulated him to activity. Not only did he write letters and pamphlets during the struggle, but when it was over he set himself to complete the vast task which his two great histories had almost covered by a *History of the Nineteenth Century*. He did not, however, live to carry it further than Waterloo. He died at Hyères on February 9, 1874, and an unseemly legal strife between his representatives took place at his funeral.

MICHELL, JOHN, an eminent English man of science of the eighteenth century. The date of his birth is unknown. He died in 1793.

MICHELOZZI, MICHELOZZO, born 1391, died 1472, was a Florentine by birth, the son of a tailor, and in early life a pupil of Donatello. He was a sculptor of some ability in marble, bronze, and silver. Though skilled both as a sculptor and as an engineer, his fame chiefly rests on his architectural works, which claim for him a position of very high honor even among the greatest names of the great fifteenth century Florentines.

MICHIGAN, one of the States of the American Union, situated in the region of the great lakes, the center of the State being 670 miles north of west from New York, the nearest point on the seaboard. The area is 58,915 square miles. The State consists of two natural divisions, known as the Upper and Lower Peninsulas. The Upper or Northern Peninsula is bounded on the north, east, and south by Lakes Superior, Huron and Michigan, and on the west by the river St. Mary and the State of Wisconsin. The Lower Peninsula is bounded on the west, north and east by Lakes Michigan, Huron, St. Clair and Erie, and the St. Clair and Detroit rivers, and on the south by the States of Ohio and Indiana. The general contour of the Lower Peninsula approaches that of a horseshoe, with an average width of about 200 miles from east to west, and a length of about 300 miles from north to south. Its surface gradually rises in gentle undulations from the surrounding lakes to an elevation of about 400 feet above Lake Huron, no point reaching an altitude of more than 600 feet. The Upper Peninsula is much more rugged in contour and surface, at some points reaching an elevation of about 1,100 feet. The territory was originally covered with forests, with only here and there a small open prairie. It abounds in fine inland lakes, with areas varying from a few acres to several miles. The rivers are not large enough to be navigable, but they afford ample water-power, and are particularly valuable for floating down the logs of the lumbering districts. The coast-line of



the State is not less than about 1,600 miles in length; and along the whole of this distance vessels of 2,000 tons may pass without losing sight of land.

The mean temperature of Lansing, the capital of the State, as determined by observations extending through eighteen years, is 46.71° Fahr., or about the same as that of Berlin. During the summer months the mean temperature is nearly the same as that of Vienna; in the winter it is nearly that of Stockholm. The annual rainfall during eighteen years was about thirty-one inches. This is very evenly distributed throughout the year, though a little more than half the amount falls in the five months from May to October. The average snow-fall in the center of the State is about four feet, though it is seldom that more than twelve inches lie on the ground at any one time. The winter temperature is much modified by the open water of the adjacent lakes. The severe winds are commonly from the west and northwest; but in sweeping across the open waters of Lake Michigan they are so far softened as to make the climate much milder than that found in the same latitude on the western side of the lake. This peculiarity is specially favorable to the growth of fruits. Peaches are grown successfully along the forty-fifth parallel, and figs thrive in the open air in latitude $42\frac{1}{2}^{\circ}$. The modifying influence of the lake winds also gives great variety to the flora. The predominant woods are oak, maple, beech, elm, ash, cherry, hickory, walnut, basswood, and pine. All these grow luxuriantly in the vast forests of the State, and afford an abundant supply of the best timber. There are 165 species of trees and shrubs indigenous to Michigan; and the entire flora of the State makes a list of 1,634 species.

The most important crop of Michigan is wheat, and the average yield per acre, as shown by the census of 1900, was large, though much less than other States in the Union. Michigan was thirteenth in rank of the wheat-producing States, the number of bushels grown being exceeded by the crops of Ohio and Indiana. This position has changed, she now occupying the ninth place. Of the fruits grown in the State apples are the most important, and these are believed to be unsurpassed in excellence in any country in the world. The product in 1899 was 8,931,569 bushels, a considerable quantity going to the markets of Europe. Next in importance is the peach crop, annually gathered from more than fifty of the counties of the State. In 1899 the peach trees in orchards numbered 8,104,415, and the number of bushels of peaches produced was 339,637. The long coast-line of Lake Michigan affords easy access to market even for the most perishable fruits. Besides the facilities thus afforded, the railroads that now thread the State, with an aggregate length in 1900 of 7,928 miles, afford abundant means of rapid transportation. As the fruit belt extends from north to south more than 200 miles, the danger of disastrous competition in the markets is obviated by prolongation of the season of ripening. At a meeting of the State Horticultural Society it was reported that the average annual value of the peach crop per acre was above \$125. The nineteen volumes of the *Transactions* of the State Horticultural Society, published since its organization in 1870, show that the development of fruit culture within the last decade has been much more rapid than in any other State.

The timber produce in Michigan is of superior quality, and the amount is so great that about two-thirds of the best lumber sold in Chicago, New York, Philadelphia, and Boston go out from its mills. The logs are borne along the lakes, rivers, and small watercourses to the booms of mills situated at convenient points, where the lumber is sawed and shipped for the different mar-

kets of the world. Of these manufacturing districts those known as the Saginaw, the Grand River, and the Muskegon valleys are the most important. The Saginaw receives the waters of the Tittabawassee, the Cass, the Flint, the Shiawassee, the Bad, the Pine, the Chippewa, the Tobacco, and their numerous tributaries, draining a vast region that still yields an undiminished supply of pine. The forests of the western parts of the State are easily accessible by the Grand River and its tributaries, while those still farther north find a natural outlet through the numerous streams that flow into Lake Michigan. On the banks of these watercourses are some of the largest and finest mills of the world. In 1854, when the first effort was made to collect statistics of this industry, it was found that there were only sixty-one mills in operation, and that the entire annual product was only 108,000,000 feet. Eighteen years later, in 1872, it was estimated that the annual product was not less than 2,560,000 feet of oaks, 12,700,000 staves, 300,000,000 lath, 400,000,000 shingles, and 2,500,000,000 of sawed pine. The number of sawmills had already reached about 1,500, the number of persons employed 20,000, and the capital represented \$25,000,000. In 1881 the manufacture of pine lumber amounted to 3,919,500,000 feet, the value of which exceeded \$60,000,000. The aggregate value of the forest products of the State was estimated in 1881 to have reached more than \$1,000,000,000. These figures have slightly decreased since that date.

Lumbering is the second great industrial interest of the state. The forests of northern Michigan are mostly pine, much of it as the cork-pine of superior quality and greatly in demand; and for many years the lumber product has been enormous. In 1888 it was: Lumber, 4,197,741,224 feet; shingles, 2,560,930,250. In places, however, this industry is beginning to decline, from the extensive destruction of the forests. Other leading manufactures, in order, are grist-mills, foundries and machine shops, iron and steel works, and those of agricultural implements and of furniture. But agriculture remains the chief industry, employing about half the population. This is one of the greatest wheat states, its average yield per acre $19\frac{1}{2}$ bushels. The next most important crops are maize, oats, and barley; and in the "fruit belt," a narrow strip of about 200 miles in length on the west shore of Lake Michigan, peaches, plums, grapes, and other fruits are grown in great quantity. It is the fourth state in the Union for wool, of which 11,898,047 pounds were marketed in 1888.

Of the mineral products of Michigan the most important is iron. As early as 1842 the report of the first state geologist, Dr. Douglas Houghton, called attention to the presence of hematite ore, though for a considerable time after this it was not found in such quantities as to make it certain that mining could be made profitable. Before 1860, however, it became known that iron in the Upper Peninsula not only existed in vast quantities, but also that it was of superior quality. Michigan minerals are of extraordinary richness—62.6 per cent. being the average of the first-class ores, while the furnace books often show a much higher yield. In salt and timber Michigan leads the United States, and in iron and copper the world. The great Calumet and Hecla copper-mines, the largest operated, with perhaps one exception, are on the Keweenaw Peninsula. The total copper output of 1889 was 43,613 tons, of a quality nowhere surpassed, and for certain purposes unequalled. In the same year 5,829,828 long tons of iron ore were mined, mainly in Marquette county. Some gold is found in the upper peninsula, and silver and lead in small amounts. Gypsum appears in immense deposits at Grand Rapids in the lower peninsula, where 19,823 tons of landplaster and 206,380 barrels of stucco were

produced in 1889. Building-stones abound in both peninsulas, and in the upper there are also statuary and other marbles, and such ornamental stones as agates, jasper, chalcedony, chlorastolites, and others. Glass-sand is found in the extreme southeast of the state; lime, brick, tiles, etc., are made easily and cheaply. Of the many mineral springs nineteen have become popular resorts; and the waters of four have a commercial value.

Within a few years the salt-works of Michigan have also come to exceed those of any other State in the Union. The salt-producing rock covers no less than about 8,000 square miles, and it is safe to presume that the supply is inexhaustible. The average depth of the wells is about 800 feet, but in some localities wells sunk to nearly 2,000 feet have been remunerative. The inspection of salt during the year ending November 30, 1890, was 3,838,637 barrels.

There are also certain other minerals of considerable importance. Deposits of gypsum, easily accessible, practically inexhaustible in quantity, and superior in quality, are found in several localities both in the eastern and in the western parts of the Lower Peninsula. In the outskirts of Grand Rapids the deposit crops out at the surface, and at an average depth of from forty to seventy feet extends over an area of ten or twelve square miles. The rock is easily quarried, and is either ground for use as a fertilizer or calcined into plaster of Paris. The deposits of coal are supposed to cover about 8,000 square miles, but as yet the product at any one point has not been very considerable. In quality the coal is highly bituminous, and is not sufficiently pure to be useful for smelting or for the manufacture of gas. For these reasons the stock of coal in the State is practically untouched. If future explorations and experiments should make these deposits available, a new era in the manufacture of iron will be the result. At present the coal for smelting the Lake Superior ores is brought chiefly from Ohio and Pennsylvania. Quarries of limestone and of sandstone have been opened in various parts of the State. The brown stone of the Upper Peninsula is of excellent quality, and is capable of receiving a high finish. The supply is inexhaustible, and the accessibility of the quarries by water gives promise of a thriving industry. The grindstones taken from the Huron county quarries are of superior quality, and the slates found in unlimited quantities on the shores of the Huron Bay are unsurpassed in point of durability and color. Clays and sands of commercial value are found in great abundance. Though the manufacture of glass is yet in its infancy, sand in large quantities has been discovered in Monroe county suitable for the manufacture of plate glass of excellent quality. Brick and tile clays are found in all parts of the State. Though native silver has been found in small quantities in the Upper Peninsula, the systematic mining of this metal has not yet been carried on with successful results.

The geographical position of Michigan explains the fact that its fresh-water fisheries are the most productive in the United States. The most important varieties of fish are lake-trout, sturgeon, bass, pickerel, herring, brook-trout, grayling, and whitefish. General laws for the protection of fish have been passed; and a fish commission has been maintained for some years for the purpose of propagating the best varieties and planting them in waters adapted to their natural development.

As early as 1785 the law of Congress which provided for the sale of lands north of the Ohio river reserved for the support of public schools "section 16" of each township. This fundamental law devoted to educational purposes one-thirty-sixth of all the lands of that vast domain known as the Northwest Territory. The "ordinance of 1787," by which this territory was organized,

further provided that "schools and the means of education shall forever be encouraged." In 1826 this congressional action was supplemented by a grant to Michigan of two townships of land for the founding and support of a university. When Michigan became a State, in 1837, its educational policy took a definite form. The constitution provided, not only that the grant of "section 16" should be devoted exclusively to the support of schools of the primary grade, but also that the State, and not each township, should be the custodian of the lands so appropriated. The constitution expressly provided that the proceeds from the sale of "school lands" should be held by the State as a perpetual fund, the interest of which should be annually applied to the support of primary schools. The lands devoted to school purposes in Michigan under these provisions amounted to 1,077,209 acres. On the sum realized by sales, the State pays interest at 7 per cent., and the resulting income is annually distributed to the schools. This source is supplemented from local taxes.

The schools organized under State law are known as graded and ungraded. In the small districts where the schools are under the charge of but one or two teachers, grading is impracticable. The school census includes all children between the ages of five and twenty. In the graded schools the division is into primary schools, grammar schools, and high schools, each of these divisions retaining the scholar ordinarily four years. At the end of the course the student is ready for the university, to which, under certain restrictions provided by the university itself, he is admitted on diploma from the high school. The University of Michigan, situated at Ann Arbor, was first opened for instruction in 1841. It now (1889) consists of the department of literature, science, and the arts, the department of medicine, the department of law, the college of homœopathic medicine, the school of pharmacy, the college of dental surgery, and the school of political science. Connected with the medical department are the State hospitals.

Latest official statistics show that Michigan has practically no State debt, there being only a few thousand dollars outstanding and that having ceased to bear interest. The county debts amount to about \$1,600,000. The receipts of the State treasury for 1901 were \$5,875,973 and the disbursements \$5,700,007, but there was a large balance from the previous year, and on June 30 there was \$2,627,523 in the treasury.

At the end of the school year there were 7,145 school districts, with a school population of 640,069, of whom 423,604 were enrolled in the public schools. The value of school property was \$13,286,667, and the total school revenue was \$6,368,734.

The railroad system of the State is extensive, the track mileage in 1900 being returned at 8,240 miles. The total revenue for the year 1900 was \$39,607,833; the operating expenses \$34,613,791, and the amount of taxation on this income was \$1,353,549.

In 1837 the state had 174,647 inhabitants. The numbers, according to the different census returns from 1840, are given in the following table:

Census.	Total.	Males.	Females.	Density per Square Mile.
1840	212,267	113,788	98,479	3.77
1850	397,654	209,897	187,757	7.07
1860	749,113	394,604	354,419	12.11
1870	1,184,059	617,745	566,314	20.01
1900	2,420,982	1,248,995	1,172,977	42.20

In 1900 the population was 2,420,982, being a gain of 327,093, or 15.6 per cent. over that of 1890.

At the 1900 census 541,653 of the inhabitants were of foreign birth, 197,346 being natives of the United Kingdom, 189,085 Germans, and 46,445 Scandinavians.

The following are the principal cities in the State:—Detroit, Grand Rapids, Bay City, East Saginaw, Jackson, Muskegon, Saginaw, Port Huron, Flint, Lansing (the state capital), Ann Arbor, Adrian, Battle Creek, Manistee, West Bay, Alpena, Ishpeming.

The State of Michigan is part of the territory that was first settled by the French, and until the fall of Canada into the hands of the British after the middle of the eighteenth century was under the government of New France. The territory was explored by Jesuit missionaries in the seventeenth century; but, although it was known at an early period that the lands were of exceptional excellence, very little progress was made in developing the resources of the Territory until after the completion of the first half century of the American Union. The surveyors employed by the general government to inspect the lands and report as to their fitness for settlement by the soldiers of the war of 1812 appear to have derived their impressions almost exclusively from the low lands in the southeastern corner of the Territory. The report, accordingly, was not favorable; and consequently the tide of immigration that had already begun to set in flowed steadily past Michigan into the Territories farther west. It was largely for this reason that the early development of Indiana, Illinois, Iowa, and Wisconsin was somewhat more rapid than that of Michigan. But gradually the false impressions concerning the soil and climate were dispelled; and within the past few years the increase of the population and the growth of wealth have been very rapid.

MICHIGAN, LAKE. See **ST. LAWRENCE.**

MICHIGAN CITY, a town of the United States, in Laporte county, Ind., on the southeast shore of Lake Michigan, forty miles east-southeast of Chicago. As a lake port and a junction for several railroads, it is a place of considerable prosperity. It is the largest lumber market in the State, and one of the largest in the west, and has numerous manufacturing establishments. The northern State prison (with 878 convicts at the close of 1901) is one of the principal buildings. The population increased from 3,985 in 1870 to 14,850 in 1900.

MICHMASH, the scene of one of the most striking episodes in Old Testament history, was a place in Benjamin, about nine Roman miles north of Jerusalem. Though it did not rank as a city, Michmash was recolized after the exile, and, favored by the possession of excellent wheat-land, was still a very large village in the time of Eusebius. The modern Makhmás is quite a small place.

MICKIEWICZ, ADAM, Polish poet, was born in 1798, near Nowogrodek, in the present government of Minsk, and died in 1855.

MICKLE, WILLIAM JULIUS, son of the minister of Langholm, Dumfriesshire, Scotland, holds a respectable place among the imitative minor poets of the eighteenth century. He was born in 1734 and died in 1788.

MICROMETER, an instrument generally applied to telescopes and microscopes for measuring small angular distances with the former or the dimensions of small objects with the latter.

Before the invention of the telescope the accuracy of astronomical observations was necessarily limited by the angle that could be distinguished by the naked eye. The angle between two objects, such as stars or the opposite limbs of the sun, was measured by directing an arm furnished with fine "sights" (in the sense of the "sights" of a rifle) first upon one of the objects and then upon the other, or by employing an instrument

having two arms each furnished with a pair of sights, and directing one pair of sights upon one object and the second pair upon the other. The angle through which the arm was moved, or, in the latter case, the angle between the two arms, was read off upon a finely graduated arc. With such means no very high accuracy was possible.

The invention of the telescope at once extended the possibilities of accuracy in astronomical measurements. The planets were shown to have visible disks, and to be attended by satellites whose distance and position angle relative to the planet it was desirable to measure. It became, in fact, essential to invent a "micrometer" for measuring the small angles which were thus for the first time rendered sensible. There is now no doubt that William Gascoigne, a young gentleman of Yorkshire, was the first inventor of the micrometer.

The principle of Gascoigne's micrometer is that two pointers, having parallel edges at right angles to the measuring screw, are moved in opposite directions symmetrically with and at right angles to the axis of the telescope. The micrometer is at zero when the two edges are brought exactly together. The edges are then separated till they are tangent to the opposite limbs of the disk of the planet to be measured, or till they respectively bisect two stars, the angle between which is to be determined. The symmetrical separation of the edges is produced and measured by a single screw; the fractions of a revolution of the screw are obtained by an index attached to one end of the screw, reading on a dial divided into 100 equal parts. The whole arrangement is elegant and ingenious.

As the powers of the telescope were gradually developed, it was found that the finest hairs or filaments of silk, or the thinnest silver wires that could be drawn, were much too thick for the refined purposes of the astronomer, as they entirely obliterated the image of a star in the more powerful telescopes. To obviate this difficulty Prof. Felice Fontana, of Florence, first proposed the use of spider webs in micrometers, but it was not till the attention of Troughton had been directed to the subject by Rittenhouse that the idea was carried into practice.

MICRONESIA. The term "Micronesia" embraces that region of the Pacific north of the great Melanesian islands, where, either perhaps from a greater or more rapid subsidence, or from the decreasing activity northward of the coral builders, the islands become, generally speaking, smaller and fewer, and finally cease. Accordingly, excepting the Marianas or Ladrões, which are of volcanic origin, and a few isolated instances of elevation in the Carolines, the Micronesian islands, though many of the groups cover a vast area, are almost without exception very small low coral (atoll) formations. Besides the **LADRONE** and **CAROLINE ISLANDS** (*q.v.*) Micronesia includes the Marshall and Gilbert groups, and some geographers include the Anson group, a number of small, widely-scattered islets to the west of Hawaii, the Magellan group farther west, and the Bonin Islands north of the Ladrões.

Northeasterly winds prevail during the winter months over the Marshalls, Ladrões, and Carolines, except in the extreme west, while between May and September the influence of the monsoon causes unsettled weather from the west, with heavy gales. In the Gilberts the southeast trade-wind brings fine weather at this season.

MICROPHONE. See **TELEPHONE.**

MICROSCOPE. The microscope is an optical instrument for the examination of minute objects or parts of objects, which enlarges the visual pictures formed upon the retina of the observer by the rays proceeding from them.

Microscopes are distinguished as *simple* or *compound*. In the former, the rays which enter the eye of the observer come from an object brought near to it after refraction through either a single lens or a combination of lenses acting as a single lens—its action as a “magnifier” depending on its enabling the eye to form a distinct image of the object at a much shorter distance than would otherwise be possible. The latter consists of at least two lenses, so placed relatively to the object, to the eye, and to one another that an enlarged image of the object, formed by the lens placed nearest to it (the “object-glass”), is looked at through the lens nearest the eye (the “eye-glass”), which acts as a simple microscope in “magnifying” it; so that the compound microscope may be described as a simple microscope used to look at an enlarged image of the object, instead of at the object itself.

Simple Microscope.—Any solid or liquid transparent medium of lenticular form, having either one convex and one flat surface or two convex surfaces whose axes are coincident, may serve as a “magnifier”—what is essential being that it shall have the power of so refracting the rays which pass through it as to cause widely diverging rays to become either parallel or but slightly divergent. Thus if a minute object be placed on a slip of glass, and a single drop of water be carefully placed upon it, the drop will act as a magnifier in virtue of the convexity of its upper surface; so that when the eye is brought sufficiently near it (the glass being, of course, held horizontally, so as not to distort the spherical curvature of the drop) the object will be seen much enlarged. And if a small hole be made in a thin plate of metal, and a minute drop of water be inserted in it, this drop, having two convex surfaces, will serve as a still more powerful magnifier. There is reason to believe that the magnifying power of transparent media with convex surfaces was very early known. A convex lens of rock-crystal was found by Layard among the ruins of the palace of Nimrud. And it is pretty certain that, after the invention of glass, hollow spheres blown of that material and filled with water were commonly used as magnifiers. The perfection of gem-cutting shown in ancient gems, especially in those of very minute size, could not have been attained without the use of such aids to the visual power; and there can be little doubt that the artificers who could execute these wonderful works could also shape and polish the magnifiers best suited for their own or others' use. Though it is impossible to say when convex lenses of glass were first made by grinding, it is quite certain that they were first generally used to assist ordinary vision as “spectacles,” the use of which can be traced back nearly six centuries; and not only were spectacle-makers the first to produce glass magnifiers (or simple microscopes), but by them also the telescope and the compound microscope were first invented. There seems no reason to believe, however, that lenses of very high magnifying power (or short focus) were produced until a demand for them had been created by the introduction of the compound microscope, in which such lenses are required as “object-glasses;” and the difficulty of working lenses of high curvature with the requisite accuracy led in the first instance to the employment of globules made by fusing the ends of threads of spun glass.

Compound Microscope.—The placing of two convex lenses in such relative positions that one should magnify an enlarged image of a small near object formed by the other naturally soon followed the invention of the telescope, and seems to have first occurred to Hans Zanzs or his son Zacharias Zanzs, spectacle-makers at Middelburg, in Holland, about 1590. One of their

compound microscopes, which they presented to Prince Maurice, was in the year 1617 in the possession of Cornelius Drebell of Alkmaar, who then resided in London as mathematician to King James I.

It has been only within the last seventy years (1820-30) that the microscope has undergone the important improvement which had been worked out by Dollond in the refracting telescope more than sixty years previously—namely, the correction of the chromatic aberration of its objectives by the combination of concave lenses of flint-glass with convex lenses of crown, while their spherical aberration is corrected by the combination (as in Herschel's aplanatic doublet) of convex and concave surfaces of different curvatures. The minute size and high curvature of the lenses required as microscopic objectives were long considered as altogether precluding the possibility of success in the production of such combinations.

It seems to have been by Professor Amici, then of Modena, about 1812, that the first attempts were made at the achromatization of microscopic objectives; but, these attempts not proving successful, he turned his attention to the production of a reflecting microscope, which was a decided improvement upon the non-achromatized compound microscopes then in use. In the year 1820, however, the subject was taken up by Selligues and Chevalier of Paris, who adopted the plan of superposing three or four combinations, each consisting of a double-convex of crown cemented to a plano-concave of flint. The back combination (that nearest to the eye) was of somewhat lower power than those placed in front of it, but these last were all of the same focus, and no attempt was made by these opticians to vary the construction of the several pairs thus united, so as to make them correct each other's aberrations. Hence, although a considerable magnifying power could be thus obtained, with an almost complete extinction of chromatic aberration, the aperture of these objectives could not be greatly widened without the impairment of the distinctness of the image by a “coma” proceeding from uncorrected spherical aberration.

In ignorance, it would appear, of what was being done by the Paris optician, and at the instigation of Doctor Goring (a scientific amateur), Mr. Tulley—well known in London as an able constructor of telescopic objectives—began, about the year 1824, to work object-glasses for the microscope on the telescopic plan. After many trials he succeeded, in 1825, in producing a triplet of f_0 inch focus, admitting a pencil of 18° , which was so well corrected as to perform very satisfactorily with an eyepiece giving a magnifying power of 120 diameters. He afterward made a similar triplet of shorter focus, which, when placed in front of the previous one, increased the angle of the transmitted pencil to 38° , and bore an eyepiece giving a magnifying power of 300 diameters. These triplets are said by Mr. Ross to have never been exceeded by any similar combinations for accurate correction throughout the field.

Having come into possession, at the end of 1826, of an objective of Chevalier's construction, Mr. J. J. Lister carefully examined its properties, and compared them with those of Tulley's triplets; and this comparison having led him to institute further experiments, he obtained results which were at first so conflicting that they must have proved utterly bewildering to a less acute mind, but which finally led him to the enunciation of the principle on which all the best microscopic objectives are now constructed. For he discovered that the performance of such composite objectives greatly depends upon the relative position of their component combinations—the effect of the flint plano-concave upon the spherical aberration produced by the double-convex

of crown varying remarkably according to the distance of the luminous point from the front of the objective. If the radiant is at a considerable distance, the rays proceeding from it have their spherical error under-corrected; but, as the source of light is brought nearer to the glass, the flint lens produces greater proportionate effect, and the under-correction diminishes, until at length a point is reached where it disappears entirely, the rays being all brought to one point at the conjugate focus of the lens. This, then, is one aplanatic focus. If, however, the luminous point is brought still nearer to the glass, the influence of the flint continues for a time to increase, and the opposite condition of over-correction shows itself. But, on still further approximation of the radiant, the flint comes to operate with less effect, the excess of correction diminishes and at a point still nearer to the glass vanishes, and a second aplanatic focus appears. From this point onward under-correction takes the place of over-correction, and increases till the object touches the surface of the glass. As every such doublet, therefore, has two aplanatic foci for all points between which it is over-corrected, while for all points beyond it is under-corrected, the optician is enabled to combine two or more doublets with perfect security against spherical error. This will be entirely avoided if the rays be received by the front glass from its shorter aplanatic focus, and transmitted through the back glass in the direction of its longer aplanatic pencil. By the approximation of the two doublets over-correction will be reduced, while their separation will produce under-correction; and thus, by merely varying the distance between two such combinations, the correction of the spherical error may be either increased or diminished according to a definite rule.

Immersion System.—It was long since pointed out by Professor Amici that the introduction of a drop of water between the front surface of the objective and either the object itself or its covering-glass would diminish the loss of light resulting from the passage of the rays from the object or its covering-glass into air, and from air into the front glass of the objective. It was obvious to him, moreover, that when the rays enter the object-glass from water, instead of from air, both its refractive and its dispersive action will be so greatly changed as to need an important constructive modification to meet the new condition. This modification seems never to have been successfully effected by Amici himself; but his idea was taken up by the two eminent Paris opticians, MM. Hartnack and Nachet, who showed that the application of what is now known as the "immersion system" to objectives of short focus and large angular aperture is attended, not merely with the advantages expected by Professor Amici, but with others on which he did not reckon. As the loss of light by the reflection of a portion of the incident rays increases with the obliquity of their incidence, and as the proportional loss is far smaller when the oblique rays pass into glass from water than when they enter it from air, the advantage of increasing the angular aperture is more fully experienced with "immersion" than with "dry" objectives—just as Professor Amici anticipated. But, further, the immersion system allows of a greater working distance between the objective and the object than can be obtained with a dry or air objective having the same angular aperture; and this increase affords not only a greater freedom of manipulation, but also a greater range of "penetration" or "focal" depth. Further, the observer is rendered so much less dependent upon the exactness of his over-correction that it is found that water-immersion objectives of high power and considerable angular aperture, extremely well adapted for the ordinary purposes of

scientific investigation, can be constructed without it—a small departure from the standard thickness of covering-glass to which such objectives are adjusted by the maker having scarcely any effect upon the distinctness of the image. It is now the practice of several makers to supply two fronts to objectives of $\frac{1}{10}$ or $\frac{1}{12}$ inch focus, one of them fitting the objective for use "dry" (that is, in air), while the substitution of the other converts it into a water-immersion objective. And in the objectives constructed on Mr. Wenham's system no change in the front glass is needed, all that is necessary for making them work as immersion-lenses being a yet closer approximation of the front lens to the second combination, which can be made by the screw-collar.

Within the last few years, however, the immersion system has undergone a still further and most important development, by the adoption of a method originally suggested by Mr. Wenham (though never carried out by him), and independently suggested by Mr. Stephenson to Professor Abbe of Jena, under whose direction it was first worked out by Zeiss (the very able optician of Jena), who has been followed by Powell and Lealand of London, as well as by several other constructors of achromatic objectives both in England and elsewhere, with complete success. This method consists in the replacement of the water previously interposed between the covering-glass and the front glass of the objective by a liquid having the same refractive and dispersive powers as crown-glass, so that the rays issuing at any angle from the upper plane surface of the covering-glass shall enter the plane front of the objective, without any deflection from their straight course, and without any sensible loss by reflection—even the most oblique rays that proceed from the object keeping their direction unchanged until they meet the back or convex surface of the front lens of the objective. It is obvious that all the advantages derivable from the system of water-immersion will be still more thoroughly attained by this system of "homogeneous" immersion, provided that a fluid can be obtained which meets its requirements. After a long course of experiments, Professor Abbe found that oil of cedar wood so nearly corresponds with crown-glass, alike in refractive and in dispersive power, as to serve the purpose extremely well, except when it is desired to take special advantage of the most divergent or marginal rays, oil of fennel being then preferable. There are, however, strong objections to the use of these essential oils in the ordinary work of research; and it seems not unlikely that a solution of some one or more saline substances will be found more suitable. In addition to the benefit conferred by the water-immersion system, and more completely attained with the homogeneous, it may be specially pointed out that, as no correction for the thickness of the covering-glass is here required, the microscopist can feel assured that he has such a view of his object as only the most perfect correction of an air-objective can afford. This is a matter of no small importance, for while, in looking at a known object, the practiced microscopist can so adjust his air-objective to the thickness of its covering-glass as to bring out its best performance, he cannot be sure, in regard to an unknown object, what appearances it ought to present, and may be led by imperfect cover-correction to an erroneous conception of its structure.

Every improvement in the optical performance of the compound achromatic microscope has called forth a corresponding improvement in the illumination of the objects viewed by it. For the illumination of transparent objects examined by light transmitted through them under low powers of moderate angle a converging pencil of rays reflected upon their under surface by a

concave mirror is generally sufficient—a “condenser” being only needed when the imperfect transparency of the object requires the transmission of more light through it. And the microscopist engaged in ordinary biological studies, who works on very transparent objects with objectives of one-sixth or one-eighth inch focus, or one-tenth inch immersion, will find that the small concave mirror of short focus will generally prove sufficient for his needs. This mirror is usually hung at such a distance beneath the stage that parallel rays falling on it are brought to a focus in the object as it lies on a slip of glass resting on the stage; and thus, when the instrument is used by day, the light of a bright cloud (which is preferable to any other) gives a well-illuminated field, even with the powers last mentioned. But when lamplight is used its divergent rays are not brought to a focus in the object by a mirror that is fixed as just stated; and the distance of the mirror beneath the stage should be made capable of increase (which is easily done by attaching it to a lengthening bar), so as to obtain the requisite focal convergence. Still the best effects of objectives of less than one-fourth inch focus cannot be secured without the aid of an achromatic condenser, interposed between the mirror and the object, so as to bring a larger body of rays to a more exact convergence.

When objectives of still higher power are employed, the employment of such a condenser becomes indispensable; and when the highest powers are being used by lamplight, it is desirable to dispense with the mirror altogether, and to place the flame exactly in the optic axis of the microscope. The condenser should be an achromatic combination, corrected for the ordinary thickness of the glass slip on which the object lies, and capable of being so adjusted as to focus the illuminating pencil in the object.

As it is often found desirable that an object should be illuminated by central rays alone, or that the quantity of light transmitted through it should be reduced (for bringing into view delicate details of structure which are invisible when the object is flooded with light), every microscope should be provided with some means of cutting off the outer rays of the illuminating cone. The “diaphragm-plate” ordinarily used for this purpose is a disk of black metal, pivoted to the under side of the stage, and perforated with a graduated series of apertures of different diameters, any one of which can be brought, by the rotation of the disk, exactly into the optic axis of the microscope. But the required effect can be much more advantageously obtained by the “iris-diaphragm,” in which a number of converging plates of metal are made so to slide over each other by the motion of a lever or screw that the aperture is either enlarged or diminished, while always remaining practically circular as well as central; and in this manner a continuous view of the object is obtained, with a gradational modification of the light.

MICROMETRY.—The microscopist has constant need of some means of taking exact measurements of the dimensions of minute objects, or parts of objects, on the study of which he is engaged; and the accuracy of the operation will of course be proportioned to the correctness of the standard used, and the care with which it is applied.

The instruments employed in microscopic micrometry are of two kinds, the measurement being taken in one by the rotation of a fine screw with a divided milled head, while in the other a slip of glass ruled with lines at fixed distances gives a scale which forms a basis of computation. Each of these has its advantages and its disadvantages.

The stage-micrometer constructed by Fraunhofer was formerly much used by Continental microscopists.

and has the advantage of indicating the actual dimensions of the objects to be measured; but it has the two special disadvantages that a sufficiently small value cannot be conveniently given to its divisions, and that any error in its construction and working is augmented by the whole magnifying power employed. This instrument has now, however, almost entirely given place to one next described.

The screw-micrometer ordinarily used in astronomical measurements (see **MICROMETER**) can be adapted to the eyepiece of the microscope in a manner essentially the same as that in which it is applied to the telescope—its two parallel threads—of which one is fixed and the other made to approach toward or recede from this by the turning of the screw—being placed in the focus of the eyeglass, and being therefore seen as lines crossing its field of view. The object is so focused that its image is formed in the same plane; and, the latter being brought into such a position that one of its ends or margins lies in optical contact with the fixed line, the screw is turned so as to bring the movable line into the like coincidence with the other. But the distance between the lines, as given by the number of divisions of the micrometer, will here be the measurement, not of the object itself, but of its magnified image; and the value of these divisions, therefore, will depend upon the amplification given by the particular objective used. Thus suppose each division of the micrometer to have an actual value of $\frac{1}{10000}$ of an inch, and the visual image to have 100 times the linear dimensions of the object, the theoretical micrometric value of each division would be $\frac{1}{10000}$ of $\frac{1}{10000}$, or one-millionth, of an inch—a degree of minuteness, however, not practically attainable.

The costliness of a well-constructed screw-micrometer being a formidable obstacle to its general use, a similar method is more commonly adopted, which consists in the insertion of a ruled glass scale into the focus of an ordinary Huygenian eyepiece, so that its lines are projected on the field of view. This scale (ruled, like an ordinary measure, with every fifth line long, and every tenth line double the length of the fifth) is fixed in a brass inner frame, that has a slight motion in the direction of its length within an outer frame, and this last, being introduced through a pair of slits into the eyepiece just above the diaphragm, and being made to occupy the center of the field, is brought exactly into focus by unscrewing the eyeglass as far as may be requisite. When the image of the object to be measured is brought by the focal adjustment of the eyeglass into the same plane, a small pushing-screw at the end of the micrometer (whose action is antagonized by a spring at the other end) is turned until one of the long divisions of the scale is brought into optical contact with one edge of the image of the object to be measured, and the number of divisions is then counted to its other edge—the operation being exactly that of laying a rule across the real object if enlarged to the size of its image. The micrometric value of each division of this eyepiece scale must be carefully ascertained for each objective, as in the case of the screw-micrometer, the error arising from inequality of its divisions being eliminated as far as possible by taking an average of several. The principal point of inferiority in this form of micrometer is that, as its divisions cannot be made of nearly so small a value as those of the screw-micrometer, an estimate of fractional parts of them often becomes necessary, which is objectionable as involving an additional source of error. To meet this objection, Hartnack has introduced the diagonal scale used in mathematical instruments before the invention of the vernier.

Under the requirements of modern science the micro-

scope has developed into a wonderful instrument, revealing to man the heretofore hidden secrets of nature, and in some instances placing in his hand a powerful weapon of defense against the inroads of disease and death. As an instance of the latter phase of the subject, we may cite the progress made in the treatment of phthisis. Formerly this disease was held to be identical with another form of pulmonary complaint which we now know to be distinct. But the microscope has revealed to us the presence in the tuberculous deposits in the lungs of bacilli, and now *bacilli tuberculosis* and bronchial complaints known to originate in inflammation brought on by cold or exposure are classed as widely different diseases whose treatment is no less varied than is their character. But it is in determining the nature of the various urinary deposits that the microscope has done most for the science of medicine. By means of the instrument the physician is enabled to determine the morbid constituents of the urine, and thus diagnose with almost unerring certainty the majority of diseases which a few years ago were as a sealed book to him. In the various diseases of the blood, the microscope tells the physician whether there is a sufficiency or a deficiency of any one constituent, revealing to him the presence of too many or too few red corpuscles, or too much or too little of the other elements which go to make up the *ensemble* of healthy vital fluid.

It has also taken an important place as a detector of crime. Many a criminal has to thank the wonderful little instrument for giving to the world the story of his crime, which but for it would have died in his bosom, and he have gone scot-free from punishment. Let a drop of blood shed by murderous hands bespatter a floor, or a wall, or a stone, or the earth—placed under the all-seeing eye of the microscope it is *blood*—it proclaims itself as truly as though an angel had spoken the words to all the earth; even the most delicate chemical test can be seen, and the fact established that it is blood. Or it may be a hair is detached from the head of the victim. Again, the microscope imparts the secret, and it is no longer an open question as to whether it may or may not be a human hair; the very color is revealed—it can be almost matched with others yet unplucked from the victim's head or beard. Perchance in a death struggle with his slayer the victim may have scratched his opponent. Then take the accumulation of material found under his finger-nails, and if there is any human skin to be found there, no matter how minute the particles, the microscope tells the tale. Rightly used by one who understands its power it is hard to limit the field to which the instrument can be applied. Instances can be given in which every one of the examples cited here have occurred in the criminal history of the country. Thanks to the microscope, too, modern bacteriologists have been enabled to ascertain the nature of disease spores, and their best means of destruction. The list of names indebted to the microscope for their fame would include those of Koch, Pasteur, Darwin, and a host of others in all departments of research—physical, biological and philosophical. It has made plain to us what before was mysterious, and year after year but adds to its usefulness. It has taught us how to battle with blight on grapes; it has shown us the nature of curculii; it has put within our grasp the remedy for æmia; it has identified fermentative products, with mycelium, a kind of fern; and in revealing to our astonished gaze these wonders it has at the same time placed the weapons of defense within our grasp.

MIDAS, king of Phrygia, is one of those half-legendary heroes in whom religious legends have gathered around a real person. The name Midas the king occurs on a very ancient tomb in the valley of the Sangarius,

the legendary seat of the Phrygian kingdom. The Phrygian monarchy was destroyed by the Cimmerians about 670 B.C., and the last king Midas committed suicide by drinking bull's blood.

MIDDELBURG, in Holland, the ancient capital of the province of Zeeland, situated in the middle of the island of Walcheren, is mentioned as early as 1153, and receives the title "town" in a charter granted it in 1227. It has all the characteristics of an old and worn-out place. The population (25,000 in 1739) had sunk to 12,000 or 13,000 by the beginning of the nineteenth century, and has only begun recently to increase again, being about 20,000 in 1902.

MIDDLEBORO, a town of the United States, in Plymouth county, Mass., thirty-four miles south of Boston. It has a handsome town hall and a public library, manufactures woolen goods, straw goods, shoes, carriages, etc., and in 1900 had 6,885 inhabitants.

MIDDLESBOROUGH, situated near the mouth of the Tees, on its south bank, in the North Riding of Yorkshire, England, has now become the principal seat of the English iron trade. It is a municipal and parliamentary borough, locally governed by a mayor and corporation, and returns a member to parliament. In the district there are upward of 130 blast furnaces, besides large iron and steel works; and the Thomas-Gilchrist process of making steel promises for Middlesborough importance in the future as a steel entrepôt. The make of pig-iron in 1880 was 1,991,032 tons. Population, (1901), 91,317.

MIDDLESEX, an inland county in the southeast of England. On the south it is divided from Surrey and Kent by the Thames, on the east from Essex by the Lea, on the west from Buckinghamshire by the Colne, and on the north from Hertfordshire by a partly artificial and very irregular line. Although with the exception of Rutland it is the smallest county in England, its population is exceeded by that of Lancashire only. Its total area is 181,317 acres, of which 2,592 acres are common or waste lands. The longest straight line that can be drawn in the county is one of nearly twenty-eight miles from the northeastern extremity near Waltham Abbey to the southwestern at Staines. From north to south in the broadest part the distance is about fifteen miles.

Unlike other counties, Middlesex has no high sheriff appointed by the sovereign. It is subject to the city of London, and one of the sheriffs appointed by the lord mayor is sheriff for Middlesex. When Henry I. came to the throne he gave the city an extensive charter, and one of the privileges either granted or confirmed by the king was the perpetual sheriffwick of Middlesex.

The whole of the county is included in the diocese of London, and is divided between the archdeaconries of London and Middlesex. When Henry VIII. created the bishopric of Westminster he allotted the whole county (the parish of Fulham alone excepted) for its diocese. Edward VI., however, dissolved the bishopric in the fourth year of his reign.

The country is divided into six hundreds, which remain the same as they were at the time of the Domesday survey, except that the name of one has been changed: Ossulston (Ossulvestane D.), Edmonton (Delmetone D.), Gore (Gara D.), Elthorne (Helethorne or Helethorne D.), Spelthorne (Spelethorne or Spelethorne D.), Isleworth (Honeslaw D., i.e., Hounslow). The division into hundreds is now merely a name, and a record of a former system of local government.

The majority of hospitals are in London, but there is a training hospital at Tottenham, St. John's Hospital at Twickenham, and cottage hospitals at Enfield, Ealing, Hayes, Hillingdon, Sudbury, and Teddington.

The Royal India Lunatic Asylum is at Ealing, and the two county asylums at Holney Hatch and Hanwell.

The county is within the jurisdiction of the central criminal court and also of the metropolitan police (with the exception of the city).

Parliamentary Representation.—There are nine constituencies in Middlesex, returning nineteen members, viz., two for the county, four for the City of London, two for each of the boroughs of Westminster, Finsbury, Marylebone, the Tower Hamlets, Chelsea, and Hackney, with one for the university of London.

In the parliament of 1295 Middlesex was represented by two members; in 1298 London sent two members as well as the county. For the parliament of 1320 and subsequent parliaments London elected four members, but it does not appear that all were allowed to sit. From the fifteenth century, however, the city has always sent four members to parliament. In 1547 Westminster first sent her two members, and from that time until 1832 the only seats were those for the county and the two boroughs. In 1832 the boroughs of Finsbury, Marylebone, and Tower Hamlets were added, and in 1866 the boroughs of Chelsea and Hackney and the university of London.

History.—The district now included in Middlesex was largely occupied by forest up to a comparatively recent period, and its population must always have been very sparse. A few prehistoric remains have been discovered at various times—bones of the elephant, hippopotamus, deer, etc., at Old Brentford, elk horns near Chelsea Hospital, fossil teeth, fish, fruit, etc., at Highgate, and quite recently, in 1879, while the foundations were being dug out for Drummond's New Bank at Charing Cross, a large number of prehistoric animal remains. Flint instruments have also been found to cover a considerable area. During the British period the district is supposed to have been inhabited by Trinobantes, but the late Doctor Guest affirms that the valley of the Lea was the western boundary of that tribe. In answer to the question, What became of the district between the Lea and the Brent? this great authority states that the district was merely a march of the "Catuvellauni," a common through which ran a wide trackway, but in which was neither town, village, nor inhabited house. Doctor Guest also declares that the boundaries of the Catuvellaunanian state, a central kingdom formed or much extended by Cassivellaunus, can be traced in part along the northern limit of Middlesex by following an earthwork called Grimesditch "from Brockley Hill to the woodland of the Colne Valley and thence to the Brent, and down the Brent to the Thames." Some earthworks and encampments still exist which are attributed to the Britons.

When the country was under Roman rule great improvements, due to the growing importance of Londinium, were made in this district. Several roads in connection with the city must have been constructed, more especially the great northern and eastern roads. Doctor Guest does not believe that the present Watling street could have had any connection with the Watling street which came down the Edgeware road, passed along by Park lane, and crossed the Thames at Westminster. In the Antonine Itinerary mention is made of three stations, viz., Londinium, Sulloniace, and Pontes. Sulloniace is now Brockley Hill; Pontes is supposed by Stukeley to mean Staines, but Horsley held that it was intended for Old Windsor, and others supported the claims of Colnbrook and Longford. Roman camps have been found in many parts of the county, and Doctor Stukeley supposed that the Brill, near St. Pancras, was the site of the battle between Boadicea

and the Roman legions which has left a slight record in the name of Battle Bridge. The Roman remains found at different times are too numerous to mention here in detail. Coins, urns, and tiles were found at Enfield, a sepulchral urn at Hampstead, and numerous gold coins and ornaments at Bentley Priory, Great Stanmore, in 1781.

Cowey Stokes, about a furlong west of Walton Bridge, is supposed to be the locality of the ford by which Julius Cæsar crossed the Thames. Cæsar makes special mention of the sharp stakes which he had to encounter, and Bede says that the remains of the stakes were to be seen in his day. Camden was the first to fix upon this as the spot where Cæsar crossed, and he is supported by Doctor Guest, but the identification is not undisputed. Although a ford existed here as late as 1807, and stakes were found up to the end of the eighteenth century, it has been affirmed that they were placed in their position with another object than to oppose an enemy's progress. Roman remains have been found at Shepperton near Halliford, at the Middlesex end of the ford. A vase was dug up in 1817, and the remains of a Roman cemetery have also been discovered.

As to the earliest Saxon occupation we are left very much to conjecture, and the name itself is somewhat of a puzzle. It is evident that no tribe could have obtained the name of Middle Saxons until after the settlement of the districts on each side of it by the East and the West Saxons. As Middlesex was for a period dependent upon the kingdom of Essex, it is probable that the name did not come into use until London had become a Saxon city, although there is reason to believe that previously Saxon settlements had been made on several places by the river and elsewhere. Bede tells us that London was in the hands of King Sæberet in 604, and was then the chief town of Essex. Just a century afterward—that is, 704—the king of the East Saxons granted away land at Twickenham, showing that Middlesex was then dependent upon Essex. It is worthy of note that the two districts now forming the counties in which London and Southwark are situated were separated from the kingdoms to which they originally belonged probably on account of the importance of the city of London and the borough of Southwark, Middlesex from the kingdom of Essex and Surrey or the South Ridge (A.-S. *Suð-ridge*) from the kingdom of Kent.

Middlesex appears never to have been independent. The administrative shire was let to the men of London and their heirs to be held in farm of the king and his heirs, and the "subject share has to submit to the authority of the sheriffs chosen by the ruling city."

MIDDLETON, a market and manufacturing town of Lancashire, is situated on the Irk, near the Rochdale Canal, and on the Lancashire and Yorkshire Railway, about five miles north of Manchester and four west of Oldham. The population of the urban sanitary district of Middleton and Tonge in 1901 was 21,952.

MIDDLETON, CONYERS, the earliest and most eminent example of the spirit of theological rationalism in the English Church of the eighteenth century, was born at Richmond in Yorkshire, on December 27 (or, according to another account, on August 3), 1683, and died in 1750.

MIDDLETON, THOMAS, held a leading place among the dramatists of the reign of James I. He was born about 1570 and died in 1627.

MIDDLETOWN, a city and port of entry of the United States, and one of the shire towns of Middlesex county, Conn., lies on the right bank of the Connecticut river, about thirty miles from its mouth, directly opposite the well-known Portland quarries, and twenty-four miles from New Haven by rail. Middletown is a

place of considerable attractiveness, and the views from the higher points are particularly fine. On the high ground stand the handsome buildings of the Wesleyan (Methodist Episcopal) University. The institution, mainly organized by Wilbur Fisk, D. D., was chartered in 1831. It has a library of about 30,000 volumes. Since 1872 the courses of the university have been open to both sexes. The Berkeley Theological School is also located here. A hill one and a quarter miles to the southeast of the city is occupied by the State General Hospital for the Insane, the principal building having a frontage of 768 feet, and the grounds extending to 230 acres; and on another hill to the southwest of the city stands the State Industrial School for Girls. As vessels drawing ten feet of water can reach its wharves, Middletown carries on a considerable trade by the river. Population (1890), 9,012.

MIDDLETOWN, a manufacturing village of the United States, in Wallkill township, Orange county, N. Y., fifty-five miles north-northwest of New York, at the junction of four railroads. It is a clean, well-built place, in the midst of a fine dairy-farming and stock-raising district, manufactures saws, files, felt hats, blankets, agricultural implements, printers' materials, etc., and is the seat of the State Homœopathic Insane Asylum. The population was 14,522 in 1900.

MIDDLETOWN, a flourishing manufacturing and commercial town in Butler Co., Ohio, on the east bank of the Miami river, and on the Miami canal, thirty-four miles north of Cincinnati. The chief industries of the city are the manufacture of paper and tobacco. Middletown contains three banks, three newspaper offices, twelve churches, and high and graded schools. Two lines of railway pass through the city. Pop. (1900), 9,215.

MIDHURST, an ancient parliamentary borough and market-town of Sussex, is picturesquely situated on a gentle eminence above the south bank of the west Rother, on three railway lines, fifty miles southwest of London and twelve north from Chichester.

MIDIAN was one of the peoples of North Arabia whom the Hebrews recognized as distant kinsmen, representing them as sons of Abraham's wife Keturah.

MIDNAPUR, a district in the lieutenant-governorship of Bengal, India, is bounded on the north by Bānkurā and Bardwān, on the east by Hooghly and Howrah, on the south by the Bay of Bengal, and on the west by Singbhūm and Mānbhūm, with an area of 5,982 square miles.

MIDNAPUR, chief town and headquarters station of the above district, is situated on the north bank of the Kasāi river, with a population in 1892 of 34,491.

MIDRASH. The practical significations of *Midrash*, taken in historical order, are as follows:—(1) a book of records; (2) a recension of older, especially historical, materials; (3) search in and explanation of the Scriptures, notably the Pentateuch (in which case the plural is invariably *Midrashoth*); (4) theory as distinguished from practice; (5) a college for study and teaching; (6) an *Agadic* (that is, a free) explanation, in contradistinction to an *Halakhic* one; (7) a collection of such free explanations (in which case the plural is *Midrashim* and occasionally also *Midrashoth*). Of these seven significations (1) and (2) are to be found in the Bible, (3) and (4) are mentioned for the first time in the *Mishnah*, (5) is to be met with in the *Midrash*, while (6) and (7) are to be found in early Rabbinic writings.

The *Midrash*, from whatever point of view it may be regarded, is of the highest value. It is of the highest value, of course, to the Jew as Jew first, inasmuch as he finds there recorded the noblest ideas, sayings, and teachings of his venerable sages of early times. In the next place it has value to the Christian as Christian,

since only by these ideas, teachings, reasonings, and descriptions can the beautiful sayings of the Founder of Christianity, the reasonings of the apostles, and the imagery of the sublime but enigmatical Apocalypse be rightly understood. But its importance appeals also to the general scholar, because of the inexhaustible mines of information of all kinds it contains. The philologist will find here numerous hints on lexicography and grammar, chiefly, of course, of the Semitic languages, but also of other tongues, notably Greek and Latin. The historian will gather here a rich harvest on geography, chorography, topography, chronology, numismatics, etc. The philosopher will find here abundant and valuable notices on logic, psychology, metaphysics, theology, theosophy, æsthetics, rhetoric, poetry, mathematics, geometry, astronomy, zoölogy, botany, biology, morphology, chemistry, medicine, physics, etc. The statesman—particularly if he be inclined to follow the psalmist's advice—"from the ancients I gather understanding"—will find here valuable information on ancient ethnography in the full sense of the term—politics, political economy, law, military science, naval affairs, etc.

MIĘDZYRZECZ PODŁASKI, a district town of Russian Poland, in the government of Siedlce, sixteen miles to the east of the government capital, on the railway between Warsaw and Brest-Litovskii. Its 10,000 inhabitants—half of whom are Greek nonconformists, and half Jews and Poles—carry on some trade in bristles, and pursue minor industries.

MIERIS, the name of a family of artists who practiced painting at Leyden for three generations in the seventeenth and eighteenth centuries.

I. FRANS VAN MIERIS, the elder, son of Jan van Mieris, a goldsmith and diamond setter, was born, according to Houbraken, at Leyden, on April 16, 1635, and died there on March 12, 1681.

II. WILLEM VAN MIERIS, born in 1662, died in 1747, son of Frans. His works are extremely numerous.

III. FRANS VAN MIERIS, the younger, born in 1689, died in 1763, also lived on the traditions of his grandfather's painting-room.

MIGNARD, PIERRE, called—to distinguish him from his brother Nicholas—Le Romain, was the chief French portrait-painter of the seventeenth century. He was born at Troyes in 1610, and came of a family of painters. In 1605 he died while about to commence work on the cupola of the Invalides.

MIGNONETTE (*i. e.*, "little darling"), the name given to a popular garden flower, the *Reseda odorata* of botanists, a "fragrant weed" as Cowper calls it, highly esteemed for its delicate but delicious perfume. The mignonette is generally regarded as being of annual duration, and is a plant of diffuse decumbent twiggy habit, scarcely reaching a foot in height, clothed with bluish lanceolate entire or three-lobed leaves, and bearing longish spikes—technically racemes—or rather insignificant flowers at the ends of the numerous branches and branchlets. The plant thus naturally assumes the form of a low, dense mass of soft, green foliage studded over freely with the racemes of flowers, the latter unobtrusive and likely to be overlooked until their diffused fragrance compels attention. The native country of the original or typical mignonette has sometimes been considered doubtful, but according to the best and latest authorities it has been gathered wild on the North African coast near Algiers, in Egypt, and in Syria.

MIGUEL, MARIA EVARIST, usually known as DON MIGUEL, whose name is chiefly associated with his pretensions to the throne of Portugal, was the third son of King John VI. of Portugal, and of Carlotta Joachima, one of the Spanish Bourbons: he was born

at Lisbon on October 26, 1802. On the sudden death of John VI. in May, 1826, Pedro of Brazil, his eldest son, renounced the crown in favor of his daughter Maria da Gloria, on the understanding that she should become the wife of Miguel. The last-named got himself proclaimed sole legitimate king of Portugal in July. The power which he now enjoyed he wielded in the most tyrannical manner. The public opinion of Europe became more and more actively hostile to his reign, and after the occupation of Oporto by Don Pedro in 1832, the destruction of Miguel's fleet by Captain (afterward Sir Charles) Napier off Cape St. Vincent in 1833, and the victory of Saldanha at Santarem in 1834, Queen Christina of Spain recognized the legitimate sovereignty of Maria, and in this was followed by France and England. Don Miguel capitulated at Evora on May 29, 1834, renouncing all pretensions to the Portuguese throne, and solemnly promising never thenceforward to meddle in Peninsular affairs. He lived for some time at Rome, where he enjoyed papal recognition, but afterward retired to Bronnbach, in Baden, where he died on November 14, 1866.

MIGULINSKAYA, a Cossack village of Russia, in the government of the Don Cossacks, and in the district of Ust-Medveditsa, seventy-nine miles to the west of that town, on the left bank of the Don.

MIKHAILOVSKAYA, a Cossack village of Russia, in the government of the Don Cossacks, and in the district of Khopersk, fourteen miles to the northwest of Uryupino, on the low left bank of the Khoper, which is inundated when the river is full.

MILAN, a city of Italy, situated near the middle of the Lombard plain, on the small river Olona. It lies twenty-five miles south of the Alps at Como, thirty miles north of the Apennines, twenty miles east of the Ticino, and fifteen miles west of the Adda.

The commune of Milan consists since 1873 of the city within the walls (area 1,513 acres), and the so-called Corpi Santi without the walls (area 15,415 acres). The population of the whole area amounted to 321,839 in 1881—the city within the walls contributing 214,004.

Milan is built in a circle, the cathedral being the central point. The city is surrounded by a wall seven miles in circumference, and immediately outside the wall a fine, broad thoroughfare makes the circuit of the city. The streets inside are for the most part narrow and crooked.

Among the buildings of Milan the most important is the cathedral, begun under Gian Galeazzo Visconti, in 1386. It is built of brick cased in marble from the quarries which Visconti gave in perpetuity to the cathedral chapter. The name of the original architect is not known, but it is certain that many German master masons were called to Milan to assist the Italian builders. It is 477 feet in length and 183 in width; the nave is 155 feet high, the cupola 226 feet, and the tower 360 feet. The work was continued through many centuries, and after the designs of many masters, notably of Amadeo, who carried out the octagon cupola, and of Tibaldi, who ornamented the doors and windows of the façade in the sixteenth century. The work was finished under Napoleon, in 1805. The style is Gothic, though its purity is destroyed by the introduction of Romanesque windows and portals on the façade. The form of the church is that of a cross. Inside there are double aisles, and aisles in the transepts. The roof is supported by fifty-two columns, with canopied niches for statues instead of capitals. The windows of the tribune contain brilliant painted glass. To the right of the entrance is the tomb of Archbishop Heribert, the champion of Milanese liberty, next to that is the tomb of Otho Visconti, founder of that family as a reigning house, and in

the right transept the monument of Giacomo dei Medici, the corsair of Como, brother of Pope Pius IV. and uncle to Saint Carlo Borromeo. Under the dome, in a crypt, lies the embalmed body of this cardinal saint (1538-84), canonized for his good deeds during the great famine and plague of 1576. The body is contained in a silver sarcophagus faced with rock-crystal. The roof of the cathedral is built of blocks of white marble; and the various levels are reached by staircases carried up the buttresses; it is ornamented with turrets, pinnacles, and two thousand statues.

The royal and archiepiscopal palaces are both worthy of note. Milan is rich in works of art. The picture gallery of the Brera is one of the finest in Italy. It possesses Raphael's famous *Sposalizio* and contains many frescoes by Luini, Gaudenzio Ferrari, and Bramantino.

The industries of the district have increased very rapidly since the union of Italy, and the city is now the chief commercial center in North Italy. The principal industry of Milan and the Milanese is the production and manufacture of silk. Pop. (1901), 491,460.

MILAZZO, a city of Italy, in the province of Messina, in Sicily, twenty and one-half miles west of Messina, is built on the eastern shore of the Bay of Milazzo, partly on the isthmus of the promontory, Capo Milazzo, which divides it from the Bay of Olivieri.

MILDEW (explained as "meal-dew" or, with more probability, as "honey-dew") is a popular name given to various minute fungi from their appearance and, from the sudden, dew-like manner of their occurrence. Like many other popular names of plants, it is used to denote different species which possess very small botanical affinity. The term is applied, not only to species belonging to various systematic groups, but also to such as follow different modes of life. The corn-mildew, the hop-mildew, and the vine-mildew are, for example, parasitic upon living plants, and the mildews of damp linen and of paper are saprophytes, that is, they subsist on matter which is already dead. It is generally possible to draw a distinct line between parasitic and saprophytic fungi; a species which attacks the living body of its host does not grow on dead matter, and *vice versa*. For information regarding fungi generally see FUNGUS.

MILETUS, an ancient city on the southern shore of the Latmic Gulf, opposite the mouth of the Mæander. Before the Ionic migration it was inhabited by the Carians (*Iliad* ii. 876; Herod. i. 146); other authorities call the original people Leleges, who are always hard to distinguish from Carians. The Greek settlers from Pylus under Neleus massacred all the men in the city, and built for themselves a new city on the coast. It occupied a very favorable situation at the mouth of the rich valley of the Mæander, and was the natural outlet for the trade of southern Phrygia; it had four harbors, one of considerable size. Its power extended inland for some distance up the valley of the Mæander, and along the coast to the south, where it founded the city of Iasus.

MILFORD, a seaport, market-town, and contributory parliamentary borough (one of the Pembroke district) of Pembrokeshire, South Wales, is finely situated on the north side of Milford Haven, about eight miles west-northwest of Pembroke.

MILFORD, a post-village of the United States, in Worcester county, Mass., lies thirty-four miles southwest of Boston, at the junction of the Milford branch of the Boston and Albany Railroad with the Hopkinton, Milford and Woonsocket Railroad. It is one of the principal seats of the boot manufacture in New England, and also produces large quantities of straw goods. The population was 11,376 in 1900.

MILICZ, or MILITSCH, of Kremsier, Moravia, was

the most influential among those preachers and writers in Moravia and Bohemia who during the fourteenth century paved the way for the reforming activity of Huss and through him for that of Luther. He was born about 1325, and died in 1374.

MILITARY FRONTIER, a narrow strip of Austrian-Hungarian territory stretching along the borders of Turkey, which had for centuries a peculiar military organization, and from 1849 to 1873 constituted a crown-land. As a separate division of the monarchy it owed its existence to the necessity of maintaining during the fifteenth, sixteenth, and seventeenth centuries a strong line of defense against the invasions of the Turks, and may be said to have had its origin with the establishment of the captaincy of Zengg by Matthias Corvinus and the introduction of Uskoks (fugitives from Turkey) into the Warasdin district by the emperor Ferdinand I. By the close of the seventeenth century there were three frontier "generalates"—Carlstadt, Warasdin, and Petrinia (the last also called the Banal). After the defeat of the Turkish power by Prince Eugene it was proposed to abolish the military constitution of the frontier, but the change was successfully resisted by the inhabitants of the district; on the other hand, a new Slavonian frontier district was established in 1702, and Maria Theresa extended the organization to the march-lands of Transylvania (the Szekler frontier in 1764, the Wallachian in 1766).

MILITARY LAW consists of the statutes, rules of procedure, royal warrants, and orders and regulations which prescribe and enforce the public obligations of the officers, soldiers, and others made subject to its provisions. Its essential purpose is the maintenance of discipline; but it also includes the administrative government of the military forces of the state, more especially in the matters of enlistment, service, and billeting. The term "martial law" sometimes applied to it is, as regards modern times at least, a misnomer. For martial law as it is now understood applies not only to military persons but to the civil community, and may be described generally as the abrogation of ordinary law and the substitution for it of military force uncontrolled save by what, in the discretion of the commanding general, may be considered the necessity of the case.

The persons subject to military law are the officers on the active list and the soldiers of the regular forces (including the marines), the permanent staff of the auxiliary (*i.e.*, the militia volunteer) forces, and the officers of the militia.

When a person subject to military law commits an offense he is taken into military custody, which means either arrest in his own quarters or confinement. He must without unnecessary delay be brought before his commanding officer, who upon investigating the case may dismiss the charge if in his discretion he thinks it ought not to be proceeded with, or may take steps to bring the offender before a court-martial.

MILITARY TACTICS. See WAR.

MILITIA. The constitution of the United States provides for the foundation of a militia, declaring such an organization necessary for the protection of the State. Soon after the organization of the government, the House of Representatives appointed a committee to organize a militia. The next year the secretary of war, Knox, submitted his plans for organizing the forces. These plans combined the following features: Every male arriving at the age of eighteen was to serve thirty days of each year for the first two years, and ten days the following year, in the camps of instruction; no citizen could exercise his political and civil rights unless he were a member of the militia; all citizens between twenty-one and forty-five were to attend four days'

drill each year, and be enrolled in the main corps of the militia; all over forty-five and under sixty were to be enrolled in the reserve corps, and attend drill two days each year, for inspection of arms. The government was to bear all expenses of the organization. These features were embodied in a bill and presented to Congress, but as passed it was altered so that very little of the original was left. The law then passed is the one now in force, and its main features are, that all citizens between eighteen and forty-five shall serve in militia, and arm and equip themselves at their individual expense. This law was so crude and inadequate that it was a subject of criticism as soon as passed, and it had been tinkered at from time to time up to the threatened troubles between France and the United States, at which period the formation of a provisional army so engrossed the attention of the government that the militia was forgotten for the time being. The next step in the reformation of the militia system was attempted by President Jefferson, who recommended that only citizens between eighteen and twenty-six be enrolled, inasmuch as owing to increased population this force was thought to be sufficient. After considerable discussion the matter was dropped, no permanent result having been reached.

President Madison also recommended amendment of the militia laws, but his recommendation was barren of any results. From this time down to the outbreak of the civil war various futile attempts were made to amend the laws and improve the system. In the meantime there had sprung up a volunteer system which had supplanted the general militia, which, by the time of the outbreak of the Mexican war, was virtually dead. These volunteer companies made a brilliant record during the campaign of that war, and were an earnest of the splendid armies which, but little more than a decade after, battled for and against the continuance of the Union and filled the world with astonishment at the record of their deeds. After the war of secession was over the subject of the militia laws was again taken up, and although various plans were proposed nothing was done and the matter virtually stands as it has done for one hundred years. A feature common to all the plans latterly proposed was the substitution of a volunteer militia for the compulsory system. The law as it now stands is so utterly inapplicable that it is entirely ignored. The militia forces if levied under this law, would compose the largest body of armed men the world has ever seen, aggregating 10,880,000 of men. The following table gives the estimate of men available for military duty in the year 1901:

Maine.....	99,209	Arkansas.....	187,509
New Hampshire..	58,498	Kentucky.....	306,753
Vermont.....	49,091	Tennessee.....	288,775
Massachusetts....	461,763	Ohio.....	593,937
Rhode Island.....	61,322	Indiana.....	359,494
Connecticut.....	129,764	Michigan.....	345,854
New York.....	1,038,287	Illinois.....	688,792
New Jersey.....	269,095	Missouri.....	443,809
Pennsylvania.....	900,302	Wisconsin.....	295,577
Delaware.....	26,990	Minnesota.....	270,199
Maryland.....	170,007	Iowa.....	318,836
Virginia.....	264,883	Nebraska.....	152,219
West Virginia....	136,977	Kansas.....	210,070
North Carolina...	270,544	Nevada.....	6,045
South Carolina...	191,475	Oregon.....	59,078
Georgia.....	316,618	California.....	212,170
Florida.....	75,706	Colorado.....	77,100
Alabama.....	261,242		
Mississippi.....	221,610		
Louisiana.....	197,517		
Texas.....	435,544		
		Total (including Territories)...	10,880,707

The present organization of State troops—the National Guards—are entirely volunteer. They are to a great degree dependent on their own exertions for equipment in all respects save that of mere guns and ac-

coutrements. In some of the States the local government has taken great pains to foster their troops, but as yet they receive no help from the general government save in the matter of arms which are issued to each State by the government on the call of the governor of the State. The soldier must generally furnish his own uniform, etc., and the taste of each particular company in some of the States is consulted as regards the uniform selected, the result being a most incongruous appearance of the different bodies of troops when mustered together, there appearing even in the same regiment all the colors of the rainbow. There has been a movement made to abolish this state of affairs and to substitute therefor, a regulation compelling the adoption of an invariable uniform for the National Guard of all the States. The number of authorized troops at present (1901) in each State is as follows:

Maine	2,051	Arkansas	.....	.....
New Hampshire	1,699	Kentucky	.....	3,500
Vermont	.....	Tennessee	.....	3,000
Massachusetts	6,592	Ohio	.....	9,486
Rhode Island	1,030	Indiana	.....	4,601
Connecticut	4,108	Michigan	.....	3,429
New York	18,000	Illinois	.....	10,626
New Jersey	5,127	Missouri	.....	3,600
Pennsylvania	11,103	Wisconsin	.....	2,836
Delaware	750	Minnesota	.....	3,729
Maryland	2,700	Iowa	.....	3,694
Virginia	5,176	Nebraska	.....	2,113
West Virginia	985	Kansas	.....	2,131
North Carolina	5,000	Nevada	.....	.....
South Carolina	5,000	Oregon	.....	1,585
Georgia	12,344	California	.....	6,471
Florida	1,458	Colorado	.....	.....
Alabama	7,788			
Mississippi	1,800			
Louisiana	.....		
Texas	.....		
		Total (including Territories)	.....	187,204

MILK is the fluid secreted by the mammary glands of the division of vertebrate animals called *Mammalia*. These glands are in a rudimentary form in the Monotremes. In *Ornithorhynchus* these is no nipple, but the mouth and tongue are closely applied over the area on which the ducts open, and the fluid is withdrawn by suction on the part of the young and compression of the gland by the mother. In *Echidna* the ducts of the gland open into a small pouch, foreshadowing the larger pouches of marsupials. In marsupials the glands are more compact, and have a greater number of lobules. They are found behind the marsupial depressions or those of the pouch; they are not fewer than two on each side nor more than thirteen, six on each side and one midway. The ducts, long and slender during lactation, open on a nipple which is covered by a reflection of the skin at the back of the pouch, thus forming a kind of hood or sheath. The nipple is protruded beyond the hood during lactation, and is much elongated. The number of these nipples bears a relation to the number of young at a birth; thus the kangaroo, with one at a birth, has four nipples (two, generally the anterior pair, being in use), while the Virginia opossum, which produces six or more at a birth, has thirteen nipples. Rodents show a corresponding provision for the nourishment of the young in the number of nipples. A seeming exception is the common guinea-pig, which frequently has eight, ten, or twelve young at intervals of two or three months, and yet the mother has only two teats to serve them, turn and turn about; the original stock of the domestic species breeds, however, only once annually, and has but one to two young, so the domestic variety is a curious anomaly due to the artificial circumstances of its life. In the porcupines there are two nipples, one midway between the fore and hind leg, and the other midway between this and the base of the fore leg. In the coypu, a creature often carrying its young on its back while it swims

across rivers, the teats project from the flanks near the shoulders, and are of considerable length, so that the young readily reach them. The *Insectivora* have, as a rule, more nipples than are found in any other order. Thus in the tenrec (*Centetes*) there are as many as twenty-two, and they are rarely fewer than fourteen, spread out in pairs from the pectoral to the inguinal regions. There are ten teats in the common hedgehog, six to eight in moles and shrews, two in sloths and armadillos. In *Cetacea* there are two long, narrow, flat glands lying between the dermal and abdominal muscles, with the subcutaneous blubber separating them from the skin. The peculiarity of the arrangement in these animals, where suckling is performed under water, is the large size of the central duct, which acts as a kind of reservoir, so that the young may obtain a considerable supply in a very short time. It would appear also that when suckling takes place the nose of the young is above the surface of the water. Among ungulates, in the elephant the glands and teats are between the forelegs; in the rhinoceros they are inguinal; in the mare and ass the glands are two in number, and are found between the thighs, about nine inches in front of the vulva; the tapir has two inguinal nipples, the peccary two ventral and two inguinal, the wild sow eight nipples, while in the domestic breeds there are at least ten, extending from the pectoral to the inguinal regions. Ruminants have the glands aggregated into a round mass in the inguinal region, pendulous in full function, divisible into two glands, each of which has a large reservoir. When in use the teats, one pair or two pairs being the number, in connection with the reservoirs become so large as to receive the special name of "udder." All the deer tribe, camels, the giraffe, and all kinds of cows have four teats; most antelopes and the gazelles have two teats, while a few antelopes have four. As to *Carnivora*, the felines have usually six nipples; the wolf, jackal, fox, dog have usually eight; the seals and the walrus have four, the otters two, the weasels six, the bears six; and in the kinkajou (*Cercoleptes*) the number is reduced to two. Among *Quadrumania*, the aye-aye (*Chiromys*) has only one pair of nipples, about an inch and a half in front of the vulva; many lemurs have in addition to those a pectoral pair; in all the platyrrhine and catarrhine *Quadrumania* there is only one pair of glands, restricted to the pectoral region. Here the teats are between the forelegs, and the young clings to the mother's breast in human fashion, but there is no protrusion of the breast as in the human being. (For further details see Owen's *Anatomy of Vertebrates*, vol. iii., p. 769.)

In the human race the glands are two in number, forming, along with the skin and fat, two rounded eminences, one on each side, on the front of the thorax. They extend from the third to the sixth or seventh rib, and from the side of the sternum to the axilla. In the center projects a small conical body, the *nipple*. Around the nipple is a colored circle, or *areola*, which is darker during pregnancy, and even in women who have borne children, than in the virgin state. The surface of the nipple is wrinkled, and with a magnifying glass is seen to be covered with papillæ. It is perforated by numerous openings, the mouths of the milk ducts. The tissue of the nipple contains numerous minute blood-vessels, and it has at the base muscular fibers arranged in concentric circles and in radiating bands. It has much of the character of erectile tissue, as in the *corpora cavernosa* of the penis, becoming turgid, firm, and prominent from excitement. The base of the gland lies on the pectoral muscle, a thin layer of fascia intervening. The surface is covered with fat, which gives it the smooth rounded outline. It is amply supplied with blood by the

long thoracic artery, some other minute branches of the axillary artery, the internal intercostal artery, and the subjacent intercostals. The nerves come from the anterior and middle intercostal cutaneous branches, and the nipple is especially sensitive. The gland is composed of numerous lobes bound together by connective and adipose tissue, and each lobe is formed of smaller lobules. Each lobe has an excretory duct, and these ducts, from fifteen to twenty in number, converge toward the areola, beneath which they are dilated so as to form sinuses from one-sixth to one-fourth of an inch in caliber. From these sinuses arise the ducts which open on the surface of the nipple.

The milk of various domesticated animals is more or less used by man for food. The specific gravity of milk ordinarily ranges from 1.029 to 1.033, very seldom reaching 1.035 or falling so low as 1.027. In chemical constitution it consists of an emulsion of fatty globules (cream) in a watery alkaline solution of caseine, and a variety of sugar, peculiar to milk, called lactose. The fat (which when separated we know as butter) and the lactose constitute the carbonaceous portion of the milk regarded as food. The caseine, which forms the principal constituent of cheese, and a certain proportion of albumen which is present, form the nitrogenous, while the complex saline substances and water are the mineral constituents. These various substances are present in the proportions which render milk a perfect and typical food suitable to the wants of the young of the various animals for whom it is provided by nature. The milk of all animals, so far as is known, contains them, although they are present in somewhat different proportions. It is probable that the milk of ruminants possesses certain physical and physiological distinctions from that of non-ruminant animals, which will account for the virtues attributed to the milk of the ass and mare. For milk in its industrial aspect see DAIRYING.

MILL, JAMES, historian and political and mental philosopher, was born April 6, 1773, in the little village called Northwater Bridge (Bridge of North Esk), in the parish of Logie-Pert, in the county of Forfar, Scotland. In October, 1798, he was licensed as a preacher, but seems to have preached very seldom. His years from 1790 to 1802, besides being occupied with incessant studies extending into history and moral and political philosophy, were devoted to various tutorships.

Failing to find a career to his mind in Scotland, in 1802 he went to London in company with Sir John Stuart, then member of parliament for Kincardineshire. He soon obtained literary occupation, to which he applied himself with untiring energy. His first important venture was to start a periodical on a new plan, entitled *The Literary Journal*, which began to appear in January, 1803, and continued under his editorship till the end of 1806. It was the most comprehensive in its aims of any periodical hitherto in existence, being a summary view of all the leading departments of human knowledge.

For two or three years, from 1805 onward, Mill was editor, but at last gave it up, partly on conscientious grounds, although in conducting it he never lent himself to the expression of any illiberal views, but often made it the vehicle of the opposite.

In 1804 he wrote a pamphlet on the *Corn Trade*, advocating the impolicy of a bounty on the exportation of grain. This was the beginning of his career as a political economist. In 1805 he published a translation of Villers' work on the *Reformation*, an unsparing exposure of the vices of the papal system. It was about the end of 1806 that he entered upon the composition of the *History of India*.

In the twelve years between 1806 and 1818 he wrote

a great many articles for various periodicals. In 1808 he began to write for the *Edinburgh Review*, and contributed steadily till 1813. In 1811 a periodical named the *Philanthropist* was started by William Allen, and published in quarterly numbers till 1817. Mill co-operated with Allen both in the writing and in the management. In 1814 Macvey Napier engaged him to contribute to the supplement to the fifth edition of the *Encyclopædia Britannica*. Many of the articles became notable. In 1818 was published the *History of India*, which had a great and speedy success.

In 1824 Bentham projected the *Westminster Review*, and Mill was a principal writer for three years. In 1829 appeared the *Analysis of the Human Mind*. From 1831 to 1833 he was largely occupied in the defense of the East India Company during the controversy attending the renewal of its charter, he being in virtue of his office the spokesman of the court of directors. In 1834 Sir William Molesworth projected the *London Review*, and Mill contributed to it during the last two years of his life. His last published book was the *Fragment on Mackintosh*, which appeared in 1835. He died on June 23, 1836.

MILL, JOHN, editor of an historically important critical edition of the New Testament, was born about 1645 at Shap, in Westmoreland, England, and died in 1707.

MILL, JOHN STUART, son of JAMES MILL (*q.v.*), was born in London on May 20, 1806. His education was from first to last undertaken by his father, and is likely long to remain a standing subject for wonder and discussion. Much of the wonder is no doubt due to his father's monstrous inversion of custom, the boy being set almost as soon as he could speak to work at our time-honored subjects of secondary and higher education. He was taught the Greek alphabet at the age of three, and one of his earliest recollections, as he has recorded in his autobiography, was learning lists of common Greek words with their English meanings, written for him by his father on cards. By his eighth year he had gone through in the original a great many Greek books.

Most of Mill's fifteenth year was spent in France in the family of Sir Samuel Bentham. On his return in 1821 he continued his old studies with the addition of some new ones. One of the new studies was Roman law, which he read with John Austin, his father having half decided on the bar as the best profession open to him. Another was psychology. In 1823, when he had just completed his seventeenth year, the notion of the bar as a livelihood was abandoned, and he entered as a clerk in the examiner's office of the India House, "with the understanding that he should be employed from the beginning in preparing drafts of dispatches, and be thus trained up as a successor to those who then filled the highest departments of the office."

Mill's work at the India House, which was henceforth his livelihood, did not come before the public, and those who have scouted his political writings as the work of an abstract philosopher, entirely unacquainted with affairs, have ignored the nature of his duties. From the first he was more than a clerk, and after a short apprenticeship he was promoted, in 1828, to the responsible position of assistant examiner.

To return to his extra-official activity, which received an immense impulse about the time of his entering the India House from what must strike a man of the world as a strange source. The reading of Dumont's exposition of Bentham's doctrines in the *Traité de Législation* was an epoch in Mill's life. It awoke in him an ambition as enthusiastic and impassioned as a young man's first love.

The enthusiast of seventeen, burning to reorganize human affairs so as to secure the greatest happiness of the greatest number, set siege to the public mind through several approaches. He constituted a few of his youthful friends, imbued with the principles of his new creed, into a society which he called the "Utilitarian" Society, taking the word, as he tells us, from one of Galt's novels. Two newspapers were open to him—the *Traveler*, edited by a friend of Bentham's, and the *Chronicle*, edited by his father's friend Black. One of his first efforts was a solid argument for freedom of discussion, in a series of letters to the *Chronicle* apropos of the prosecution of Richard Carlile. But he watched all public incidents with a vigilant eye, and seized every passing opportunity of exposing departures from sound principle in parliament and courts of justice. Another outlet was opened up for him in 1824 by the starting of the *Westminster Review*, and still another in the following year in the *Parliamentary History and Review*. This year also he found a congenial occupation in editing Bentham's *Rationale of Judicial Evidence*. Into this he threw himself with zeal. And all the time, his mind full of public questions, he discussed and argued eagerly with the many men of promise and distinction who came to his father's house. He engaged in set discussions at a reading-society formed at Grote's house in 1825, and in set debates at a Speculative Society formed in the same year.

In 1826 Mill could look back to four years of eager toil. What were the results? He had become convinced that his comrades in the Utilitarian Society, who never numbered more than ten, had not the stuff in them for a world-shaking propaganda; the society itself was dissolved; the *Parliamentary Review* was a failure; the *Westminster* did not pay its expenses; Bentham's *Judicial Evidence* produced little effect on the reviewers. In the course of the next few years Mill wrote comparatively little, but he "carried on," as he says, "a quantity of thinking respecting a host of subjects." It was a period of search, deliberation, germination, and striking root.

The first sketch of Mill's political philosophy appeared in a series of contributions to the *Examiner* in the autumn of 1830 on "Prospects in France." He was in Paris soon after the July Revolution, made the acquaintance of the leading spirits among the younger men; and in his discussion of what they were doing and what they should do in making a new constitution we find the germs of many thoughts afterward more fully developed in his *Representative Government*.

By 1831 Mill's enthusiasm for humanity had been thoroughly reawakened, and had taken the definite shape of an aspiration to supply an unimpeachable method of search for conclusions in moral and social science. In his *Westminster* review of Whately's *Logic* in 1828 (invaluable to all students of the genesis of Mill's logic) he appears, curiously enough, as an ardent and brilliant champion of the syllogistic logic against highfliers such as the Scotch philosophers who talk of "superseding" it by "a supposed system of inductive logic." His inductive logic must "supplement and not supersede." It must be concatenated with the syllogistic logic, the two to be incorporated in one system. But for several years he searched in vain for the means of concatenation.

Meantime, while recurring again and again, as was his custom, to this cardinal difficulty, Mill worked indefatigably in other directions where he saw his way clear, expatiating over a wide range of political, social, economical, and philosophical questions. He had ceased to write for the *Westminster* in 1828; but during the years 1832 and 1833 he contributed many

essays to *Tait's Magazine*, the *Jurist*, and the *Monthly Repository*. In 1835 the *London Review* was started, with Mill as editor; it was amalgamated with the *Westminster* in 1836, and Mill continued editor till 1840. Much of what he wrote then was subsequently incorporated in his systematic works; some of his essays were reprinted in his first two volumes of *Dissertations and Discussions* (1859).

It was in 1837, on reading Whewell's *Inductive Science*, and re-reading Herschel, that Mill at last saw his way clear both to formulating the methods of scientific investigation and to joining on the new logic as a supplement to the old.

In the technical history of the science, Mill's *Logic* may be viewed as an attempt to fuse the practical tests of truth set forth in Herschel's *Discourse on Natural Philosophy* with the theoretic views of induction propounded in Whately's *Logic*. But in the history of thought the great importance of the work is due not so much to its endeavor to formulate the methods of science and lay bare the first principles on which they rest as to its systematic application of scientific method to what he called the moral sciences.

The *Logic* was published in 1843. In 1844 appeared his *Essays on Some Unsettled Questions in Political Economy*. These essays were worked out and written many years before, and show Mill in his first stage as a political economist. Four out of the five essays are elaborate and powerful solutions of perplexing technical problems—the distribution of the gains of international commerce, the influence of consumption on production, the definition of productive and unproductive labor, the precise relations between profits and wages.

It would seem that in his fits of despondency one of the thoughts that sat upon him like a nightmare and marred his dreams of human improvement was the apparently inexorable character of economic laws, condemning thousands of laborers to a cramped and miserable existence, and thousands more to semi-starvation. From this oppressive feeling he found relief in the thought set forth in the opening of the second book of his *Political Economy*—that, while the conditions of production have the necessity of physical laws, the distribution of what is produced among the various classes of producers is a matter of human arrangement, dependent upon alterable customs and institutions. There can be little doubt that this thought, whether or not in the clear shape that it afterward assumed, was the germ of all that is most distinctive in his system of political economy. One of his most eminent successors, the late Professor Cairnes, thus admirably summed up his work as a political economist:—"As he himself used to put it, Ricardo supplied the backbone of the science; but it is not less certain that the limbs, the joints, the muscular developments—all that renders political economy a complete and organized body of knowledge—have been the work of Mill."

While his great systematic works were in progress, Mill wrote very little on events or books of the day. He turned aside for a few months from his *Political Economy* during the winter of the Irish famine (1846-47) to advocate the creation of peasant-proprietorships as a remedy for distress and disorder in Ireland. He found time also to write elaborate articles on French history and Greek history in the *Edinburgh Review* apropos of Michelet, Guizot, and Grote, besides some less elaborate essays.

The *Political Economy* was published in 1848. Mill could now feel that the main work he had proposed for himself was accomplished; but, though he wrote comparatively little for some years afterward, he remained as much as ever on the alert for opportunities of useful

influence, and pressed on with hardly diminished enthusiasm in his search for useful truth. Among other things, he made a more thorough study of socialist writers, with the result that, though he was not converted to any of their schemes as being immediately practicable, he began to look upon some more equal distribution of the produce of labor as a practicability of the remote future, and to dwell upon the prospect of such changes in human character as might render a stable society possible without the institution of private property. This he has called his third stage as a political economist, and he says that he was helped toward it by the lady, Mrs. Taylor, who became his wife in 1851, and with whom he had lived in intimate friendship for more than twenty years before.

During the seven years of his married life Mill published less than in any other period of his career, but four of his most closely reasoned and characteristic works, the *Liberty*, the *Utilitarianism*, the *Thoughts on Parliamentary Reform*, and the *Subjection of Women*, besides his posthumously published essays on *Nature* and on the *Utility of Religion*, were thought out and partly written in collaboration with his wife. In 1856 he became head of the examiner's office in the India House, and for two years, till the dissolution of the Company in 1858, his official work, never a light task, kept him fully occupied.

On the dissolution of the Company, Mill was offered a seat in the new council, but declined. His retirement from official work was followed almost immediately by his wife's death, and from this calamity he sought relief in active literary occupation. Politics, sociology, and psychology divided as before the energies of his active mind. One of his first cares was to publish with a touching dedication to his wife the treatise on *Liberty*, which they had wrought out together, principle by principle and sentence by sentence. This pious duty discharged, he turned to current politics, and published a view of the impending Reform Bill, a pamphlet on parliamentary reform. Soon after, Mill supported in *Fraser's*, still with the same object, Mr. Hare's scheme for the representation of minorities. In the autumn of the same year he turned to psychology, reviewing Mr. Bain's works in the *Edinburgh Review*.

In this way the indefatigable thinker worked on, throwing himself by turns into the various lines along which he saw prospects of fulfilling his mission as an apostle of progress. In his *Representative Government* (1860) he systematized opinions already put forward in many casual articles and essays. His *Utilitarianism* was a closely reasoned, systematic attempt to answer objections to his ethical theory and remove misconceptions of it. His treatise on the *Subjection of Women*, in its ruling intention a protest against the abuse of power, was Mill's next work, though it was not published till 1869. His *Examination of Hamilton's Philosophy*, published in 1865, had engaged a large share of his time for three years before.

While mainly occupied in those years with philosophical studies, Mill did not remit his interest in current politics. He made his voice heard on the contest in America in 1862, taking the side of the North—then very unpopular in London—and using all his strength to explain what has since been universally recognized as the issue really at stake in the struggle, the abolition of slavery.

In 1865 a new channel was opened to his influence. He was requested to stand for Westminster, and agreed on conditions strictly in accordance with his principles of parliamentary election. He would not canvass, nor pay agents to canvass for him, nor would he engage to attend to the local business of the constituency. He

was with difficulty persuaded even to address a meeting of the electors. The story of this remarkable election has been told by Mr. James Beal, one of the most active supporters of Mill's candidature. In parliament he adhered to his lifelong principle of doing only work that needed to be done, and that no one else seemed equally able or willing to do. It may have been a consciousness of this fact which prompted a remark made by the Speaker that Mill's presence in parliament elevated the tone of debate. The impression made by him in parliament is in some danger of being forgotten, because he was not instrumental in carrying any great measure that might serve as an abiding memorial.

Mill's subscription to the election expenses of Mr. Bradlaugh and his attitude toward Governor Eyre are generally regarded as the main causes of his defeat in the general election of 1868. He retired with a sense of relief to his cottage and his literary life at Avignon.

No recluse ever had a more soothing retreat than Mill's Avignon cottage, but to the last he did not relax his laborious habits nor his ardent outlook on human affairs. The essays in the fourth volume of his *Disquisitions*—on endowments, on land, on labor, on metaphysical and psychological questions—were written for the *Fortnightly Review* at intervals after his short parliamentary career. One of his first tasks was to send his treatise on the *Subjection of Women* through the press. The essay on *Theism* was written soon after. The last public work in which he engaged was the starting of the Land Tenure Reform Association. The interception by the state of the unearned increment, and the promotion of coöperative agriculture, were the most striking features of his programme. He wrote in the *Examiner* and made a public speech in favor of the association a few months before his death. The secret of the ardor with which he took up this question probably was his conviction that a great struggle was impending in Europe between labor and capital. He regarded his project as a timely compromise.

Mill died at Avignon on May 8, 1873.

MILLAU, or MILHAU, capital of an arrondissement in the department of Aveyron, France, is situated on the left bank of the Tarn, half a mile below the point at which that river is joined by the Dourbie, and forty-eight miles to the southeast of Rodez, on the Rodez and Montpellier line. The population in 1901 was about 18,500.

MILLEDGEVILLE, a city of Georgia, in Baldwin county, of which it is the capital, lies on the Oconee river. It is a railroad and telegraph center, and was formerly (until 1867) the capital of the State, which afterward was moved to Atlanta. The town has some cotton manufactures, and contains banks, churches, schools, newspaper offices, etc. It has (1900) a population of 4,219.

MILLENNIUM. In the history of Christianity three main forces are found to have acted as auxiliaries of the gospel. They have elicited the ardent enthusiasm of many whom the bare preaching of the gospel would never have made decided converts. These are a belief in the speedy return of Christ and in His glorious reign on earth; mystical contemplation, which regards heavenly blessings as a possible possession in the present life; and faith in a divine predestination of some to salvation and others to perdition.

In the anticipations of the future prevalent among the early Christians (c. 50-150) it is necessary to distinguish a fixed and a fluctuating element. The former includes the notion that a last terrible battle with the enemies of God was impending; the faith in the speedy return of Christ; the conviction that Christ will judge all men, and will set up a kingdom of glory on earth.

To the latter belong views of the Antichrist, of the heathen world power, of the place, extent, and duration of the earthly kingdom of Christ, etc. These remained in a state of solution; they were modified from day to day, partly because of the changing circumstances of the present by which forecasts of the future were regulated, partly because the indications—real or supposed—of the ancient prophets always admitted of new combinations and constructions. But even here certain positions were agreed on in large sections of Christendom. Among these was the expectation that the future kingdom of Christ on earth should have a fixed duration—according to the most prevalent opinion, a duration of one thousand years. From this fact the whole ancient Christian eschatology was known in later times as “chiliasm”—a name which is not strictly accurate, since the doctrine of the millennium was only one feature in its scheme of the future.

This idea that the Messianic kingdom of the future on earth should have a definite duration has—like the whole eschatology of the primitive church—its roots in the Jewish apocalyptic literature, where it appears at a comparatively late period.

Jesus Himself speaks of only one return of the Son of Man—His return to judgment. In speaking of it, and of the glorious kingdom He is to introduce, He makes use of apocalyptic images; but nowhere in the discourses of Jesus is there a hint of a limited duration of the Messianic kingdom. The apostolic epistles are equally free from any trace of chiliasm. In the Apocalypse of John, however, it occurs in the following shape: After Christ has appeared from heaven in the guise of a warrior, and vanquished the antichristian world-power, the wisdom of the world, and the devil, those who have remained steadfast in the time of the last catastrophe, and have given up their lives for their faith, shall be raised up, and shall reign with Christ on this earth as a royal priesthood for one thousand years. At the end of this time Satan is to be let loose again for a short season; he will prepare a new onslaught, but God will miraculously destroy him and his hosts. Then will follow the general resurrection of the dead, the last judgment, and the creation of new heavens and a new earth. That all believers will have a share in the first resurrection and in the Messianic kingdom is an idea of which John knows nothing. The earthly kingdom of Christ is reserved for those who have endured the most terrible tribulation, who have withstood the supreme effort of the world-power—that is, for those who are actually members of the church of the last days. More than this John does not say. But other ancient Christian authors were not so cautious. Accepting the Jewish apocalypses as sacred books of venerable antiquity, they read them eagerly, and transferred their contents bodily to Christianity. Nay, more, the Gentile Christians took possession of them, and just in proportion as they were neglected by the Jews—who, after the war of Bar-Cochba, became indifferent to the Messianic hope and hardened themselves once more in devotion to the law—they were naturalized in the Christian communities. The result was that these books became “Christian” documents; it is entirely to Christian, not to Jewish, tradition that we owe their preservation, and with them the idea of the millennium.

MILLER, HUGH, eminent in science and literature, and one of the most remarkable among self-taught men of genius, was born at Cromarty, on the northeast coast of Scotland, on October 10, 1802. The enchantment of open air and freedom—the irresistible charm of mother nature on the hill and by the sea—made him at thirteen an incorrigible truant; and his schoolmaster thought it likely that he would prove a dunce. Never-

theless the truant schoolboy was already giving indications of the destination of the man. At an age too early to date he had found in his pen a divining rod that led him to waters of inexhaustible delight. His mother summed up, in the singular dialect of the district, the impression derived from her son's boyhood and youth in the words, “he was aye vritin.”

It is a curious fact that what determined Hugh Miller to apprentice himself to a stone-mason was his delight in literary composition. Unemployed during the winter frosts, the mason, he perceived, could enjoy for some months every year the ecstasy of writing. One result of his decision was that he never learned any language but English. Another was that fifteen years of the quarry and the hewing-shed, with stern experiences of over-work and privation, sowed in his frame the seeds of incurable disease. Meanwhile the advantages of his decision were indisputable. Under the discipline of labor the refractory schoolboy became a thoughtful, sober-minded man. Miller always looked back to his years of hand-labor with a satisfaction that has something in it of solemnity and pathos.

Returning to Cromarty, he worked in happy patience as a stone-cutter year after year, sedulously prosecuting at the same time the grand object of his ambition, to write good English. He found time to invigorate and enrich his mind by careful reading, and was habitually and keenly observant both of man and of nature. His reading was not extensive but well chosen. In 1829 appeared the small volume containing *Poems Written in the Leisure Hours of a Journeyman Mason*. It procured its author the valuable friendship of Mr. Robert Carruthers, and was favorably noticed by the press. Miller looked at his poems in print, and concluded, at once and irreversibly, that he would not succeed as a poet. It was a characteristic and very manly decision, proving that there was no fretting vanity in his disposition. Doubtless also it was right. His field was prose. But, though his poems yielded nothing in the way of fortune, they were a beginning of fame. Good judges in Edinburgh detected in his work the mint-mark of genius, and Miller's first prose volume, *Scenes and Legends of Cromarty*, was published there in 1835.

He was a married man, and his tent seemed stably fixed at Cromarty, when the agitation that preceded the Disruption of 1843 made the air of Scotland vibrate. Miller loved his church, and deliberately esteemed her the most valuable institution possessed by the Scottish people. Fervently as he had sympathized with those who procured political representation for Scotland by the Reform Bill, he still more fervently took part with those who claimed that Scottish congregations should have no pastors thrust upon them. In the summer of 1839 he wrote his famous pamphlet-letter to Lord Brougham; Doctor Candlish read it with “nothing short of rapture;” and the first days of 1840 saw Miller installed in the editorial chair of the *Witness* newspaper, published twice a week in Edinburgh to advocate the cause of non-intrusion and spiritual independence. He continued to edit the *Witness* till his death, which took place in the night between December 23 and 24, 1856. Unremitting brain work had overtaken a system permanently injured by the hardships of his early mason life; reason at length gave way, and Miller died by a pistol shot fired by his own hand. A *post-mortem* examination, attested by four medical men of the highest character, evinced the presence of “diseased appearances” in the brain; and he left a few words indicating the form taken by the insane delusion which had mastered him.

When, however, he had convinced himself that his

lead to the stars was not by poetry, and when the limited success of his prose tales and literary essays in the volume on Cromarty suggested a profound misgiving as to the adequacy of his purely literary materials to produce an important result, he bethought him of his hoard of scientific knowledge, and addressed himself with the concentrated energy of mature manhood to geological reading and geological researches. The principal scene of his own investigations was the Cromarty district, where he ransacked every wrinkle of the hill-side, and traced every stratum sawn through by the watercourse, and where, on the beach at ebb, in indurated clay of bluish tint and great tenacity, belonging to the Old Red Sandstone formation, he discovered and dug out nodules which, when laid open by a skillful blow of the hammer, displayed certain organisms that had never been seen by a human eye. He had entered upon correspondence with Murchison and Agassiz; and "fellows of the Geological Society and professors of colleges" had been brought by his descriptions "to explore the rocks of Cromarty." So early as September, 1840, there began to appear in the *Witness* a series of articles entitled "The Old Red Sandstone." They attracted immediate and eager attention. The articles which met with so enthusiastic a reception from the most eminent geologists in Europe formed the nucleus of a book soon after published, and entitled *The Old Red Sandstone*. He had at last fairly found his hand. Afterward followed his principal geological books, *The Footsteps of the Creator*, and *The Testimony of the Rocks*.

MILLER, WILLIAM, the founder of an American religious sect holding peculiar millennial views, was born at Pittsfield, Massachusetts, in 1781, and died in 1849. About 1843 the second coming of Christ was expected by as many as 50,000 believers in the doctrines of Miller; and, although the disappointment of their hopes somewhat diminished their numbers, many continued their adherence to his tenets regarding the nature of the millennium. At present the number of Millerites or Adventists is estimated at from 15,000 to 20,000.

MILLER, WILLIAM, one of the greatest of modern line-engravers, was born in Edinburgh May 28, 1796, and died in 1882.

MILLER'S THUMB (*Cottus gobio*), a well-known little fish, abundant in all rivers and lakes of northern and central Europe with clear water and gravelly bottom. The genus *Cottus*, to which the Miller's Thumb belongs, is easily recognized by its broad, flat head, rounded and scaleless body, large pectoral and narrow ventral fins, with two dorsal fins, the anterior shorter than the posterior; the preoperculum is armed with a simple or branched spine. The species of the genus *Cottus* are rather numerous, and are confined to the north temperate zone of the globe, the majority being marine, and known by the name of "bullheads."

MILLET is a name applied with little definiteness to a considerable number of often very variable species of cereals belonging to distinct genera and even subfamilies of *Gramineæ*. The true millet, however, is generally admitted to be *Panicum* (*Setaria*) *miliaceum*, L. It is indigenous to the East Indies and North Australia, but is mentioned by Hippocrates and Theophrastus as already cultivated in South Europe in their time. Some suppose it to be one of the earliest grains used in bread-making, and ascribe the origin of its name to *panis*, bread, rather than to the paniculate inflorescence. It is annual, requires rich but friable soil, grows to about three or four feet high, and is characterized by its bristly, much branched nodding panicles. One variety has black grains. It is largely cultivated in India, southern Europe, and northern Africa, and ripens as

far north as southern Germany, in fact, wherever the climate admits of the production of wine. The grain, which is very nutritious, is used in the form of groats, and makes excellent bread when mixed with wheaten flour. It is also largely used for feeding poultry and cage-birds, for which purpose mainly it is imported.

But the most important dry grain of the tropical countries of Africa and Asia, particularly of India, is *Sorghum vulgare*, great millet, indian millet, turkish millet, or guinea corn. It ranges probably as extensively as wheat, being also largely cultivated in southern Europe, the United States, and the West Indies. In Asia Minor, Arabia, Italy, and Spain it may be said to replace oats and barley. It is annual, and may reach twelve feet in height; it is extremely prolific, even rivaling maize, of which it is a near congener. Its flour is very white, but does not easily make good bread; it is largely used in cakes and puddings and for feeding cattle and poultry. The panicles are used for brooms, and the roots for velvet-brushes.

MILLET, JEAN FRANÇOIS, was a painter of French peasant life, and it may be questioned whether France has produced in our day any greater or more original artist. He himself came of a peasant family, and was born on October 4, 1814, in the hamlet of Gruchy, near Gréville (La Manche), in the wild and picturesque district called La Hague. On January 20, 1875, he died. He was buried in the churchyard of Chailly, by the side of his friend Rousseau.

MILL SPRINGS, a village in Wayne county, Ky., on the Cumberland river, about eighty miles south of Lexington, is famous as the scene of a battle between the Union and Confederate forces, which occurred on January 19, 1862. Gen. George H. Thomas commanded the Federal troops and inflicted a severe defeat upon the Confederates, who were under the command of Gen. George B. Crittenden.

MILMAN, HENRY HART, dean of St. Paul's, was born February 10, 1791. In 1816 he was ordained, and was soon afterward presented to the living of St. Mary's, Reading. He had already made his appearance as a dramatic writer, his tragedy of *Fazio*, founded on a narrative in the *Annual Register* for 1795, having been brought on the stage without his knowledge under the title of *The Italian Wife*. The death struggle of an expiring nation in the *Fall of Jerusalem* (1820), the conflict of new truth and old order, of religious enthusiasm and earthly affection, in the *Martyr of Antioch* (1822), are depicted with great eloquence and real insight into human nature. *Belshazzar* (1822) is in general a pale copy of Byron's *Sardanapalus*. His tragedy of *Anne Boleyn* (1826) is a poor performance. With the exception of admirable versions of the Sanskrit episode of Nala and Damayanti, and of the *Agamemnon* and *Baccha*, this was Milman's last poetical work. In 1830 his *History of the Jews* appeared in the Family Library. His *History of Christianity under the Empire* had appeared in 1840, but had been completely ignored. Widely different was the reception of the continuation, his great *History of Latin Christianity* to the death of Pope Nicholas V., which appeared in 1855. He also edited Gibbon and Horace, and at his death in 1868 left behind him almost finished a delightful history of his own cathedral, which was completed and published by his son.

MILO, one of the most famous athletes of Greece, whose name became proverbial for personal strength, lived about the end of the sixth century B.C. The traditional account of his death is often used to point a moral: he found a tree which some woodcutters had partly split with a wedge, and attempted to rend it asunder; but the wedge fell out, and the tree closed on

his hand, imprisoning him till wolves came and devoured him.

MILO was the surname of T. Annii Papianus, one of the best-known of the partisan leaders and ruffians in the stormy times that preceded the dissolution of the Roman republic. P. Clodius, the leader of the ruffians who professed the democratic cause, was his personal enemy, and their brawls in the streets and their mutual accusations in the law courts lasted for several years, beginning when Milo was tribune of the commons in 57 B.C. Milo joined the insurrection of M. Cælius in 48 B.C., and was soon slain near Thurii in Lucania. His wife Fausta was daughter of the dictator Sulla.

MILTIADES. See GREECE.

MILTON, JOHN, was born in Bread street, Cheap-side, London, on December 9, 1608. Again and again Milton speaks with gratitude and affection of the ungrudging pains bestowed by his father on his early education. This brings us to about the year 1619, when Milton was ten years of age. At that time his domestic tutor was Thomas Young, a Scotsman from Perthshire, and graduate of the university of St. Andrews, afterward a man of no small distinction among the English Puritan clergy, but then only curate or assistant to some parish clergyman in or near London, and eking out his livelihood by private teaching.

On February 12, 1624-25, Milton, at the age of sixteen years and two months, was entered as a student of Christ's College, Cambridge, in the grade of a "Lesser Pensioner." His matriculation entry in the books of the university is two months later, April 9, 1625. Between these two dates James I. had died, and had been succeeded by Charles I.

Milton's academic course lasted seven years and five months, or from February, 1624-25, to July, 1632, bringing him from his seventeenth year to his twenty-fourth. The first four years were his time of undergraduate-ship. In July, 1632, Milton completed his career at the university by taking his M.A. degree.

Of Milton's skill at Cambridge in what Wood calls "the collegiate and academical exercises" specimens remain in his *Prohæusiones Quædam Oratoriæ*. They consist of seven rhetorical Latin essays, generally in a whimsical vein, delivered by him, in his undergraduate-ship or during his subsequent bachelorship in arts, either in the hall of Christ's College or in the public University School. Relics of Milton's Cambridge period are also four of his Latin *Familiar Epistles*; but more important are the poetical remains. These include the greater number of his preserved Latin poems—to wit, (1) the seven pieces which compose his *Elegiarum Liber*, two of the most interesting of them addressed to his medical friend, Charles Diodati, and one to his former tutor Young in his exile at Hamburg, (2) the five short Gunpowder Plot epigrams, now appended to the *Elegies*, and (3) the first five pieces of the *Sylvarum Liber*, the most important of which are the hexameter poem *In Quintum Novembris* and the piece entitled *Naturam non pati senium*. Of the English poems of the Cambridge period the following is a dated list:—*On the Death of a Fair Infant*, 1625-26, the subject being the death in that inclement winter of his infant niece, the first-born child of his sister, Mrs. Phillips; *At a Vacation Exercise in the College*, 1628; the magnificent Christmas ode *On the Morning of Christ's Nativity*, 1629; the fragment called *The Passion* and the *Song on May Morning*, both probably belonging to 1630; the lines *On Shakespeare*, certainly belonging to that year; the two facetious pieces *On the University Carrier*, 1630-31; the *Epitaph on the Marchioness of Winchester*, 1631; the sonnet *To the Nightingale*, probably of the same year; the sonnet

On arriving at the Age of twenty-three, dating itself certainly in December, 1631.

Just before Milton quitted Cambridge, his father, then verging on his seventieth year, had practically retired from his Bread street business, leaving the active management of it to a partner, named Thomas Bower, a former apprentice of his, and had gone to spend his declining years at Horton in Buckinghamshire, a small village near Colnbrook, and not far from Windsor. Here, accordingly, in a house close to Horton church, Milton mainly resided for the next six years—from July, 1632, to April, 1638.

It is an interesting fact that Milton's very first public appearance in the world of English authorship was in so honorable a place as the second folio edition of *Shakespeare* in 1632. Among the poems actually written by Milton at Horton the first, in all probability, after the Latin hexameters *Ad Patrem*, were the exquisite companion pieces *L'Allegro* and *Il Penseroso*. There followed, in or about 1633, the fragment called *Arcades*. Next in order among the compositions at Horton may be mentioned the three short pieces, *Ata Solenn Music*, *On Time*, and *Upon the Circumcision*; after which comes *Comus*, the largest and most important of all Milton's minor poems. From September, 1634, to the beginning of 1637 is a comparative blank in our records. The year 1637 was eventful in his biography. It was in that year that his *Comus*, after lying in manuscript for more than two years, was published by itself, in the form of a small quarto of thirty-five pages. The author's name was withheld, and the entire responsibility of the publication was assumed by Henry Lawes. In November, 1637, and probably at Horton, whence the plague had by that time vanished, he wrote his matchless pastoral monody of *Lycidas*. It was early in 1638, when Milton was in his thirtieth year, that copies of his *Lycidas* may have been in circulation among those who had already become acquainted with his *Comus*.

Milton was then on the wing for a foreign tour. He had long set his heart on a visit to Italy, and circumstances now favored his wish. Before the end of April, 1638, he was on his way across the Channel, taking one English man-servant with him. He was home again in August, 1639, having been absent in all fifteen or sixteen months. Milton's continental tour, and especially the Italian portion of it, remained one of the chief pleasures of his memory through all his subsequent life. Nor was it quite without fruits of a literary kind. Besides two of his Latin *Epistolæ Familiæres*, one to the Florentine grammarian Buommattei, and the other to Lucas Holstenius, there have to be assigned to Milton's sixteen months on the continent his three Latin epigrams *Ad Leonoram Romæ Canentem*, his Latin scazons *Ad Salsillum Poetam Romanum Ægrotantem*, his fine and valuable poem, in Latin hexameters, entitled *Mansus*, and his *Five Italian sonnets*, with a *Canzone*, celebrating the charms of some Italian lady he had met in his travels.

One sad and marring memory did mingle itself with all that was otherwise so delightful in his Italian reminiscences. His bosom friend and companion from boyhood, the half-Italian, Charles Diodati, who had been to him as Jonathan to David, and into whose ear he had hoped to pour the whole narrative of what he had seen and done abroad, had died during his absence. How profoundly this affected him appears from his *Epitaphium Damonis*, then written in memory of his dead friend. The importance of this poem in Milton's biography cannot be overrated. It is perhaps the noblest of all his Latin poems; and, though in the form of a pastoral, and even of a pastoral of the most artificial

sort, it is unmistakably an outburst of the most passionate personal grief.

Not long after Milton's return the house at Horton ceased to be the family home. Christopher Milton and his wife went to reside at Reading, taking the old gentleman with them, while Milton himself preferred London. He had first taken lodgings in St. Bride's Churchyard, at the foot of Fleet street; but, after awhile, probably early in 1640, he removed to a "pretty garden house" of his own, at the end of an entry, in the part of Aldersgate street which lies immediately on the city side of what is now Maidenhead court. His sister, whose first husband had died in 1631, had married a Mr. Thomas Agar, his successor in the Crown Office; and it was arranged that her two sons by her first husband should be educated by their uncle. John Phillips, the younger of them, only nine years old, had boarded with him in the St. Bride's Churchyard lodgings; and, after the removal to Aldersgate street, the other brother, Edward Phillips, only a year older, became his boarder also. Gradually a few other boys, the sons of well-to-do personal friends, joined the two Phillipses, whether as boarders or for daily lessons, so that the house in Aldersgate street became a small private school. The drudgery of teaching seems always to have been liked by Milton. A list in his own handwriting among the Milton MSS. at Cambridge, shows what subject for poetical treatment he was contemplating at that time. It contains jottings of no fewer than fifty-three subjects from the Old Testament, eight from the Gospels, thirty-three from British and English history before the Conquest, and five from Scottish history. It is interesting to observe which of the subjects fascinated Milton most. Though some of them are sketched pretty fully, not one is sketched at such length and so particularly as *Paradise Lost*. It is the first subject on the list, and there are four separate drafts of a possible tragedy under that title, two of them merely enumerating the *dramatis personæ*, but the last two indicating the plot and the division into acts. Thus, in 1640, twenty-seven years before *Paradise Lost* was given to the world, he had put down the name on paper, and had committed himself to the theme.

The controversies of the two parties, royalists and roundheads, together with the peculiar attitude of the ecclesiastical authorities called from Milton's pen several tracts, among them being one on the *Reformation Touching Church Discipline*, and another *The Reason of Church Government*. Numerous other productions from his pen mark this period. The greatest of the four, and the most important of all Milton's anti-Episcopal pamphlets after the first, is that entitled *The Reason of Church Government*.

In 1643 he married Mary Powell. Hardly were the honeymoon festivities over in Aldersgate street when, her sister and other relatives having returned home and left her alone with her husband, she pined for home again and begged to be allowed to go back on a visit. Milton consented, on the understanding that the visit was to be a brief one. This seems to have been in July, 1643. Soon, however, the intimation from Forest Hill was that he need not look ever to have his wife in his house again.

Milton's conduct under the insult of his wife's desertion was most characteristic. Always fearless and speculative, he converted his own case into a public protest against the existing law and theory of marriage. *The Doctrine and Discipline of Divorce Restored, to the good of both Sexes*, was the title of a pamphlet put forth by him in August, 1643, without his name, but with no effort at concealment, declaring the notion of a sac-

ramental sanctity in the marriage relation to be a clerically invented superstition, and arguing that inherent incompatibility of character, or contrariety of mind, between two married persons, is a perfectly just reason for divorce. For this he narrowly escaped prosecution.

Among the questions in agitation in the general ferment of opinion brought about by the civil war was that of a reform of the national system of education and especially of the universities. To this question Milton made a contribution in June, 1644, in a small *Tract on Education*. In the very next month, however, July, 1644, he returned to the divorce subject in a pamphlet addressed specially to the clergy and entitled *The Judgment of Martin Bucer Concerning Divorce*. Strenuous efforts were made to bring him within definite parliamentary censure, and the matter came before committee both in the House and in the Lords. It is to this circumstance that the world owes the most popular and eloquent, if not the greatest, of all Milton's prose-writings, his famous *Areopagitica*, a *Speech of Mr. John Milton for the Liberty of Unlicensed Printing to the Parliament of England*. It appeared in the end of November, 1644, deliberately unlicensed and unregistered, as was proper on such an occasion, and was a remonstrance addressed to the parliament. To this period there belong, in the shape of verse, only his sonnets ix. and x., the first to some anonymous lady, and the second "to the Lady Margaret Ley." His divorce speculation, however, still occupied him; and in March, 1644-45 he published simultaneously his *Tetrachordon*, or *Expositions upon the four chief places of Scripture which treat of Marriage*, and his *Colasterion*, a *Reply to a nameless Answer against the Doctrine and Discipline of Divorce*. In these he replied to his chief recent assailants, lay and clerical, with merciless severity.

So far as Milton was concerned personally, his interest in the divorce speculation came to an end in July or August, 1645, when, by friendly interference, a reconciliation was effected between him and his wife. The ruin of the king's cause at Naseby had suggested to the Powells that it might be as well for their daughter to go back to her husband after their two years of separation. It was not, however, in the house in Aldersgate street that she rejoined him, but in a larger house, which he had taken in the adjacent street called Barbican, for the accommodation of an increasing number of pupils.

The house in Barbican was tenanted by Milton from about August, 1645, to September or October, 1647. Among his first occupations there must have been the revision of the proof sheets of the first edition of his collected poems. It appeared as a tiny volume, copies of which are now very rare, with the title *Poems of Mr. John Milton, both English and Latin, composed at several times*. The title page gives the date 1645, but January, 1645-46 seems to have been the exact month of the publication.

The first Englishman of mark out of parliament to attach himself openly to the new republic after the execution of Charles was John Milton. This he did by the publication of his pamphlet entitled *Tenure of Kings and Magistrates, proving that it is lawful, and hath been held so in all ages, for any who have the power, to call to account a Tyrant or wicked King, and, after due conviction, to depose and put him to death, if the ordinary Magistrate have neglected to do it*. It was out within a fortnight after the king's death, and was Milton's last performance in the house of High Holborn. The chiefs of the new republic could not but perceive the importance of securing the services of a man who had so opportunely and so powerfully spoken out in favor of their tremendous act, and who

was otherwise so distinguished. In March, 1648-49, accordingly, Milton was offered, and accepted, the secretaryship for foreign tongues to the council of state of the new Commonwealth.

At the date of Milton's appointment to the secretaryship he was forty years of age. His special duty was the drafting of such letters as were sent by the council of state, or sometimes by the Rump Parliament, to foreign states and princes, with the examination and translation of letters in reply, and with personal conferences, when necessary, with the agents of foreign powers in London, and with envoys and ambassadors. Hence from the first, his employment in very miscellaneous work. He was employed in the examination of suspected papers, and in interviews with their authors and printers; and he executed several great literary commissions expressly intrusted to him by the council. The first of these was his pamphlet entitled *Observations on Ormond's Articles of Peace with the Irish Rebels*. More important still was the *Eikonoklastes* (which may be translated "Image-Smasher"), published by Milton in October, 1649, by way of counterblast to the famous *Eikon Basilike* ("Royal Image"), which had been in circulation in thousands of copies since the king's death, and had become a kind of Bible in all royalist households, on the supposition that it had been written by the royal martyr himself. A third piece of work was of a more laborious nature. In the end of 1649 there appeared abroad, under the title of *Defensio Regia pro Carolo I.*, a Latin vindication of the memory of Charles, with an attack on the English Commonwealth, intended for circulation on the Continent. To answer it was thought a task worthy of Milton. Milton's Latin *Pro Populo Anglicano Defensio*, as it was called, ran at once over the British Islands and the Continent, rousing acclamation everywhere, and received by scholars as an annihilation of the great Salmasius.

About the end of 1651 Milton left his official rooms in Whitehall for a house he had taken on the edge of St. James' Park, in what was then called Petty France, Westminster, but is now York street. The house existed till 1880, but has been pulled down. He had now more to do in the special work of his office, in consequence of the increase of correspondence with foreign powers. But he had for some time been in ailing health; and a dimness of eyesight which had been growing upon him gradually for ten years had been settling rapidly, since his labor over the answer to Salmasius, into total blindness. Actually, before or about May, 1652, when he was but in his forty-fourth year, his blindness was total, and he could go about only with some one to lead him. He recovered sufficiently to resume his secretarial duties, and the total number of his dictated state letters for the single year 1652 is equal to that of all the state letters of his preceding term of secretaryship put together.

On April 20, 1653, there was Cromwell's great act of armed interference by which he turned out the small remnant of the Rump Parliament, dismissed their council of state, and assumed the government of England, Ireland, and Scotland into his own hands. Milton, whose boundless admiration of Cromwell had shown itself already in his Irish tract of 1649 and in his recent sonnet, was recognized as one of the Oliverians. He remained in Oliver's service and was his Latin secretary through the whole of the Protectorate.

Milton married a second time in 1656, his wife dying fifteen months later leaving no children.

Cromwell's death on September 3, 1658, left the Protectorship to his son Richard. Milton and Marvell continued in their posts, and a number of the Foreign Office letters of the new Protectorate were of Milton's

composition. Thinking the time fit, he also put forth, in October 1658, a new edition of his *Defensio Prima*, and, early in 1659, a new English pamphlet, entitled *Treatise of Civil Power in Ecclesiastical Causes*, ventilating those notions of his as to the separation of church and state which he had been obliged of late to keep to himself. To Richard's Protectorate also belongs one of Milton's Latin *Familiar Epistles*. Meanwhile, though all had seemed quiet round Richard at first, the jealousies of the army officers left about him by Oliver, and the conflict of political elements let loose by Oliver's death, were preparing his downfall. In May, 1659, Richard's Protectorate was at an end. On April 25th, the Convention Parliament met; on May 1st, they resolved unanimously that the government by King, Lords, and Commons should be restored; and on May 29, 1660, Charles II. made his triumphal entry into London. The chief republicans had by that time scattered themselves, and Milton was in hiding in an obscure part of the city.

How Milton escaped the scaffold at the Restoration is a mystery now, and was a mystery at the time. Actually, in the terrible course through the two Houses of the Convention Parliament of that Bill of Indemnity by which the fates of the surviving regicides and of so many others of the chief republican culprits were determined, Milton was named for special punishment. It was voted by the Commons that he should be taken into custody by the sergeant-at-arms, for prosecution by the attorney-general on account of his *Eikonoklastes* and *Defensio Prima*, and that all copies of those books should be called in and burnt by the hangman. There was, however, some powerful combination of friendly influences in his favor, with Monk probably abetting. At all events, on August 29, 1660, when the Indemnity Bill did come out complete, with the king's assent, granting full pardon to all for their past offenses, with the exception of about a hundred persons named in the bill itself for various degrees of punishment, thirty-four of them for death and twenty-six for the highest penalty short of death, Milton did not appear as one of the exceptions on any ground or in any of the grades. From that moment, therefore, he could emerge from his hiding, and go about as a free man.

Milton did not return to Petty France. For the first months after he was free he lived as closely as possible in a house near what is now Red Lion square, Holborn. Thence he removed, apparently early in 1661, to a house in Jewin street, in his old Aldersgate-street and Barbican neighborhood.

In Jewin street Milton remained for two or three years, or from 1661 to 1664.

During this time he contracted his (third) marriage with Elizabeth Minshull, of a good Cheshire family, and a relative of Doctor Paget's. They were married on February 24, 1662-63, the wife being then only in her twenty-fifth year, while Milton was in his fifty-fifth. She proved an excellent wife; and the Jewin street household, though the daughters remained in it, must have been under better management from the time of her entry into it. From that date Milton's circumstances must have been more comfortable, and his thoughts about himself less abject, than they had been through the two preceding years. All the while of his seeming degradation he had found some solace in renewed industry of various kinds among his books and tasks of scholarship, and all the while, more particularly, he had been building up his *Paradise Lost*. He had begun the poem in earnest, we are told, in his house in Petty France, in the last year of Cromwell's Protectorate, and then not in the dramatic form contemplated eighteen years before, but deliberately in the epic form.

He had made but little way when there came the interruption of the anarchy preceeding the Restoration and of the Restoration itself; but the work had been resumed in Jewin street and prosecuted there steadily, by dictations of twenty or thirty lines at a time to whatever friendly or hired amanuensis chanced to be at hand. Considerable progress had been made in this way before his third marriage; and after that the work proceeded apace, his nephew, Edward Phillips, who was then out in the world on his own account, looking in when he could to revise the growing manuscript.

It was not in the house in Jewin street, however, that *Paradise Lost* was finished. Not very long after the third marriage, probably in 1664, there was a removal to another house, with a garden, not far from Jewin street, but in a more private portion of the same suburb. This, which was to be the last of all Milton's London residences, was in the part of the present Bunhill row which faces the houses that conceal the London artillery ground and was then known as "Artillery Walk, leading to Bunhill Fields." Here the poem was certainly finished before July, 1665. Why the poem was not published immediately does not distinctly appear, but may be explained partly by the fact that the official licenser hesitated before granting the necessary *imprimatur* to a book by a man of such notorious republican antecedents, and partly by the paralysis of all business in London by the Great Fire of September, 1666. It was not till April 27, 1667, that Milton concluded an agreement with a publisher for the printing of his epic. By the agreement of that date, still extant, Milton sold to Samuel Simmons, printer, of Aldersgate street, London; for \$25 down, the promise of another \$25 after the sale of a first edition of thirteen hundred copies, and the further promise of two additional sums of \$25 each after the sale of two more editions of the same size respectively, all his copyright and commercial interest in *Paradise Lost* for ever. It was as if an author now were to part with all his rights in a volume for \$87 down, and a contingency of \$262 more in three equal installments. The poem was duly entered by Simmons as ready for publication in the Stationers' Register on the 20th of the following August; and shortly after that date it was out in London as a neatly printed small quarto, with the title *Paradise Lost: A Poem written in Ten Books: By John Milton*. The publishing price was 3s., equal to about \$2.62 now. It is worth noting as an historical coincidence that the poem appeared just at the time of the fall and disgrace of Clarendon.

The remaining years of Milton's life, extending through that part of the reign of Charles II. which figures in English history under the name of "The Cabal Administration," were by no means unproductive. His literary activity only ceased with his life. On November 8, 1674, being a Sunday, Milton died, in his house in Bunhill, of "gout struck in," or gout-fever, at the age of sixty-five years and eleven months. He was buried, the next Thursday, in the church of St. Giles, Cripplegate, beside his father, a considerable concourse attending the funeral.

MILTON, a Pennsylvania town in Northumberland county, lies on the west branch of the Susquehanna river. It has railroad and telegraph connections, several iron-works and lumber working establishments, and banks, churches, schools, etc. A newspaper is published here. Population (1900), 6,175.

MILLVILLE, a town of New Jersey, in Cumberland county. The town has railroad and telegraph connections, and contains several glass and other manufacturing, together with banks, churches, schools, etc. Several newspapers are published here, and the town had (1900) a population of 10,583.

MILWAUKEE, the largest city in the State of Wisconsin, is situated on the west shore of Lake Michigan, 100 miles north of its southern end, and eighty miles north of Chicago, and 1,000 miles northwest of New York by rail. The shore of the lake is 600 feet above the level of the sea.

The Milwaukee and Menomonee rivers unite in the center of the business portion of the city, about half a mile from their entrance to Lake Michigan, where they are joined by a third and smaller stream—the Kinnikinnic. A bay 6 miles from cape to cape, and 3 miles broad, stretches in front of the city, which commands a fine water view, the ground rising along the shore 80 feet above the level of the lake, then gradually sloping westward to the Milwaukee river, and again rising on the west and north to a height of 125 feet. The ground also rises to a commanding elevation south of the valley of the Menomonee. Few cities present so many natural attractions of site, as indeed its Indian name indicates ("the beautiful hollow or bay"); and art has added to nature. In the residence parts of the city there are miles of avenues from 70 to 100 feet wide, lined on both sides with elms and maples, behind which stand handsome houses with spacious lawns, fountains, and evergreens, giving the appearance of a continuous park. The material used for building is largely the cream-colored brick made in the vicinity, from which Milwaukee is sometimes called the "Cream City." The climate, tempered by the great lake, is remarkably pleasant and healthy. The mean temperature, as shown by the records of twenty years, is 46.7° Fahr. The coldest month is January (average 22.37°), the hottest July (70.4°). During the last few years the average death-rate has been but 20 per 1,000, showing it to be one of the healthiest of American cities. Besides a full complement of the usual religious and charitable institutions, there is adjoining the city the national home for disabled United States volunteer soldiers, consisting of several buildings situated in grounds of 400 acres extent, which serve the purpose of a city park. There are numerous lodges belonging to the freemasons and other societies; and the Turners' societies, which embrace a large membership and own some valuable buildings, have done much to create and keep up the practice of athletic exercises among the citizens. Two excellent musical societies are also established here.

Before the year 1835 Milwaukee was known only as an Indian trading-post occupied by a Frenchman named Solomon Juneau, who is generally spoken of as the founder of the city. The total inhabitants in 1838 numbered only 700; in 1840 there were 1,712; but in 1846 the population amounted to 9,666, in 1850 to 20,061, in 1855 to 30,118, in 1860 to 45,246, in 1870 to 71,440, and in 1880 to 115,578 (57,475 males and 58,103 females). In 1900 the population had increased to 285,315, more than one-half of them of foreign parentage, a very large majority being Germans. Notwithstanding the multitude of nationalities represented in the population, there are few cities more orderly and law-abiding, the number of police employed being less than one for every 1,500 inhabitants. Another feature worthy of mention is the large proportion of families who own their own houses, and this is true not only as to the mercantile and professional classes, but especially as to the laboring population. Although the grain trade, formerly very large here, has now greatly diminished, the growth and prosperity of the city have not materially suffered, owing to the development of manufacturing industries, for which the low rents, healthy climate, and advantageous location make it well adapted. A large portion of the population are engaged in the manufacture of clothing, cigars, cooperage, leather,

bricks, sashes, doors, and blinds, machinery and flour (of which 1,000,000 barrels are made annually), and in meat-packing. Milwaukee has become famous for its lager beer, of which there are over 1,000,000 barrels annually produced. The malt liquor establishments of the city have a combined capital of \$29,000,000, and yielded a product of \$15,000,000 in 1900. The value of the products, in 1900, of the foundries and machine shops was \$14,500,000, and that of the flouring and grist mills, \$6,357,983; of iron and steel, \$7,410,213; of leather tanning, \$10,267,835; of slaughtering and meat packing, wholesale, \$5,980,340; of carpentering, \$3,324,734; of agricultural implements, \$2,296,888; and of lumber, planing mill products, \$2,152,994. The lake commerce is very large, the tonnage entered and cleared being about as large as that of Baltimore, Boston, or Philadelphia.

Milwaukee is governed by a mayor and a common council. The streets and public buildings are under the charge of the board of public works, composed of commissioners and the city engineer, all subject to the common council. A bountiful supply of water is obtained from the lake, and the streets are well supplied with sewers. The value of property as assessed for taxation was \$165,224,887 in 1900—the city debt being \$6,410,750, mostly for the water-works, which are city property. City budget for 1902, \$2,736,610.

There is an efficient system of public schools, under a superintendent and board of school commissioners, the value of the buildings with their sites being estimated at over \$700,000. For the higher education there are a high school, a normal school, and three commercial colleges, while the Roman Catholics and Lutherans have several excellent denominational seminaries and colleges. A public library belongs to the city. The city has an efficient police force of 181 members, and a fire department of twelve steamers, eleven hose carriages, five hook and ladder trucks, one fire boat, four chemical engines, and 164 men.

The mayor's message for 1889 shows that 22 miles of streets and alleys were improved during the year at an expense of \$338,000. The area of the city equals 10,734 acres, or 16 77-100 square miles; the entire length of streets paved is 30½ miles; of streets otherwise improved, 170 miles; of sewers, exclusive of the large Menomonee special sewer, 147 miles; and of water mains, 147½ miles.

MIMICRY is the name given in biology to the advantageous resemblance (usually protective) which one species of animal or plant often shows to another. The word was first applied in this metaphorical sense by Mr. W. H. Bates, and it has since been accurately defined and limited, in its biological application. Briefly put, the essence of the phenomenon of mimicry consists in the following relation. A certain species of plant or animal possesses some special means of defense from its enemies, such as a sting, a powerful and disagreeable odor, a nauseous taste, or a hard integument. Some other species inhabiting the same district or a part of it, and not itself provided with the same special means of defense, closely resembles the first species in all external points of form and color, though often very different in structure and unrelated in the biological order.

The theoretical explanation of mimicry on evolutionary principles may best be considered in connection with the general subject of protective coloration and variation in form, of which it is a very special case. There are two ways in which imitative coloring may benefit a species. It may help the members of the species to escape the notice of enemies, or it may help them to deceive prey. In the first case imitative hues enable the animal or plant to avoid being itself devoured; in the second case they enable it to devour others more easily,

and so to secure a larger amount of food than less deceptively colored compeers. In the former instance we must suppose that such individuals as did not possess the deceptive coloring have been discovered and destroyed by enemies with a highly developed sight, while those which possessed it have survived. In the latter instance we must suppose that the individuals which have no protective coloring have failed to secure sufficient prey, through too readily betraying their presence, and that only those which possessed such coloring have become the parents of future generations. It is difficult however, to separate these two cases, and in many instances the same coloring may aid a species both in escaping its peculiar enemies and in deceiving its peculiar prey.

MIMNERMUS, a Greek elegiac poet, born at Smyrna, lived about 600 B.C. His life fell in the troubled time when the old Greek city of Smyrna was struggling to maintain itself against the rising power of the Lydian kings. His experience in life was evidently sad; he felt that his country was gradually yielding to the enemy it had once defeated, and he knew that his own hopes were disappointed.

MIMOSA. The *Mimosa* (so named from their mimicry of animal movements) form one of the three suborders of *Leguminosae*, and are characterized by their (usually small) regular flowers and valvate corolla. Their twenty-eight genera and 1,100 species are arranged by Baillon in four series, of which the acacias (see *ACACIA*) and the true mimosas are the most important. They are distributed throughout almost all tropical and subtropical regions, the acacias preponderating in Australia and the true mimosas in America. The former are of considerable importance as sources of timber, gum, and tannin, but the latter are of much less economic value, though a few, like the talh (*M. ferruginea*) of Arabia and Central Africa, are important trees. Most are herbs or under shrubs, but some South American species are tall woody climbers. They are often prickly. The roots of some Brazilian species are poisonous, and that of *M. pudica*, L., has irritating properties. *M. sensitiva* has been used in America in the treatment of fistula, etc., probably as an astringent. The mimosas, however, owe their interest and their extensive cultivation, partly to the beauty of their usually bipinnate foliage, but still more to the remarkable development in some species of the sleep movements manifested to some extent by most of the pinnate *Leguminosae*, as well as many other (especially seedling) plants. In the so-called "sensitive plants" these movements not only take place under the influence of light and darkness, but can be easily excited by mechanical and other stimuli. When stimulated, say at the axis of one of the secondary petioles, the leaflets move upward on each side until they meet, the movement being propagated centripetally. It may then be communicated to the leaflets of the other secondary petioles, which close (the petioles, too, converging), and thence to the main petiole, which sinks rapidly downward toward the stem, the bending taking place at the pulvinus, or swollen base of the leafstalk. When shaken in any way, the leaves close and droop simultaneously, but if the agitation be continued, they reopen as if they had become accustomed to the shocks. The common sensitive plant of hot houses is *M. pudica*, L., a native of tropical America, but now naturalized in corresponding latitudes of Asia and Africa; but the hardly distinguishable *M. sensitiva* and others are also cultivated. The common wild sensitive plants of the United States are two species of the closely allied genus *Schrankia*.

MINDANAO, **MINDORO**. See **PHILIPPINE ISLANDS**.

MINDEN, the chief town of a district of the same name in Prussia, province of Westphalia, is situated about twenty-two miles to the west-southwest of Hanover, on the left bank of the Weser, which is spanned there by two bridges. Population in 1901 about 20,000.

MINE. See **MINING**.

MINERALOGY. Natural objects which are homogeneous in their mass, and in which no parts formed for special purposes can be distinguished, are termed "minerals"; and the branch of natural science which treats of these is termed mineralogy. Minerals differ from the structures treated of in botany and zoölogy in the three following particulars. They differ in the mode of their formation; this has been accomplished, not by assimilation of matter, producing growth from within, but by augmentation of bulk through accretion of particles from without. Minerals are not heterogeneous. While the objects treated of in the other departments of natural history consist of beings possessed of life, and having parts which, being mutually dependent, cannot be separated from one another without a more or less complete destruction of the individual, the objects treated of under the department of mineralogy have so uniformly consistent an individuality that they are not destroyed by any separation of parts—each portion or fragment possessing the same properties and the same composition as the whole. And while those beings which are possessed of life have their component elements grouped into complexes, for the most part capable of more or less freedom of motion and susceptible of change, minerals have a constitution resulting from chemical attractions alone and an arrangement of their parts, under physical influences, which has resulted in rigidity and an absence of all tendency to change.

The most precise definition of a mineral would be—an inorganic body possessed of a definite chemical composition, and usually of a regular geometric form. Of these, the second is in one respect the direct outcome of the first; while many of the most important physical properties possessed by minerals are outcomes of the second.

Both the geometric form and the composition of minerals are produced and modified under the influence of general laws.

Mineral bodies occur in the three physical conditions of solid, liquid, and gas. Those now found in the last two states are few in number, and are of altogether inferior interest to those which occur as solids; but there is reason to believe that the minerals we know as solids once existed in the liquid or gaseous state, and that their present structure was determined in the process of solidification. All bodies thus formed may be divided into two great classes:

Amorphous bodies, or such as do not possess a definite and characteristic geometrical form. These (when transparent) refract light singly in every direction (except when under stress); they are equally easy or equally difficult to break in all directions; when broken they exhibit a conchoidal or an earthy fracture; they are equally hard throughout all their parts; they are equally elastic in all directions; they conduct heat with equal rapidity and in equal amount in all directions.

Crystalline bodies, or such as occur in definite geometrical forms bounded by flat surfaces, present greater facilities of separation of their particles, or "cleavage," in certain directions lying in determinate planes than they do in others; most of them are neither equally hard nor equally elastic in all directions, conduct heat more rapidly in certain directions than they do in others, and, when transparent, refract light doubly except in certain directions.

Mineral bodies are found in both the above classes;

and the same mineral body may occur in both the amorphous and the crystalline condition. Under favoring circumstances, it is possible that every substance whose composition is capable of being represented by a definite chemical formula—i.e., which has an unvarying composition—may be capable of assuming a definite crystalline form.

Size and Form of Crystals.—They are of every size from over a yard in diameter to mere specks requiring a high power of the microscope to reveal their existence. Beryls have been obtained in America more than 4 feet in length by $2\frac{1}{2}$ in thickness, weighing $2\frac{1}{2}$ tons. Equally large crystals of apatite have been found in Canada. There is a rock crystal at Milan $3\frac{1}{4}$ feet long by $5\frac{1}{2}$ in circumference, weighing 870 pounds. The highest perfection of form, and hence of other properties, is only found, however, in crystals of moderate or of small size.

Variety of Form, and Constancy of Form.—The same mineral may be found in different localities, or sometimes in the same locality, exhibiting an almost endless variety of forms. Calc-spar occurs at a Scottish locality in acicular pyramidal crystals of which the length may be ten or more times as great as the width; in flat plates as thin as paper, in which the length is not the hundredth part of the width; also in prisms, pyramids, and rhombohedra, which at first sight seem destitute of any relationship to each other. This substance has elsewhere been noted in several hundred forms. The minerals fluorite, pyrite, and baryte have each been observed in over a hundred diverse forms. Nevertheless, however great the number, all the forms, in the case of each mineral, may be reduced or referred to a single type, by the simple process of examining its internal structure or the mode of arrangement of its molecules. This is accomplished in two ways—by finding the weak joints in that arrangement, through splitting the crystal, and by measuring the angular inclination of the outside surfaces which bound the form and, from these measurements, by simple mathematical laws, arriving at what has been termed its "primitive" or simplest form.

As regards the mere recognition of a substance, such measurement in itself suffices—the angular inclination, if the same surfaces be measured, being unvarying in each species. It can, moreover, be shown that the possible range of external variety of form is governed by fixed mathematical laws, which determine precisely what crystalline forms are or may be produced for each species. Comparatively few of these actually occur in nature; but crystallographic laws can point out the range of those which can possibly occur, can delineate them even before they are found, and can in all cases show the relationship which subsists between them and the simple or fundamental form from which or out of which they all originate. It must be observed that in crystalline bodies the internal structure—that is, the arrangement of the molecules—is as regular in an outwardly shapeless mass as in the modeled crystal which presents itself as a perfect whole.

Definitions of Crystals, and their Members or Parts.

—A crystal is a symmetrical solid, either opaque or transparent, contained within surfaces which theoretically are flat, and of a perfect polish, but which are actually frequently curved, striated, or pitted. The surfaces are called "planes," or "faces." The external planes of a crystal are called its "natural planes;" the flat surfaces obtained by splitting a crystal are called its "cleavage planes." The intersections of the bounding planes are called "edges," and planes are said to be similar when their corresponding edges are proportional and their corresponding angles equal. Crystals bounded by equal and similar faces are termed "simple forms."

The cube, bounded by six equal squares, the octahedron, bounded by eight equilateral triangles, and the rhombohedron, bounded by six equal rhombs, are thus simple forms. Crystals of which the faces are not all equal and similar are termed compound forms, or "combinations," being regarded as produced by the union or combination of two or more simple forms. Edges are termed rectangular, obtuse, or acute, according as the angle at which the faces which form the edge meet is equal to, or greater or less than, a right angle. Edges are similar when the planes by the intersection of which they are formed are respectively equal and equally inclined to one another; otherwise they are unlike or dissimilar.

When a figure is bounded by only one set of planes, it is said to be "developed." When an edge is cut off by a new plane, it is said to be "replaced;" when cut off by a plane which forms an equal angle with each of the original faces which formed the edge, it is said to be "truncated." When an edge is cut off by two new faces equally inclined to the two original faces respectively, it is said to be "beveled." When a solid angle is cut off by a new face which forms equal angles with all the faces which went to form the solid angle, it is said to be truncated.

In classifying crystals and studying their properties, it is found convenient to introduce certain imaginary lines called "axes." Axes are imaginary lines connecting points in the crystal which are diametrically opposite—such as the centers of opposite faces, the apices of opposite solid angles, the centers of opposite edges. Different sets of axes may thus be drawn through the same crystal; but there is always one set, usually of three, but in one special class of crystals of four, axes, by reference to which the geometrical and physical properties of a crystal can be most simply explained. These axes intersect one another, either at right angles, producing "orthometric" forms, or at oblique angles, producing "clinometric" forms. The axes may be all equal, or only two equal, or all unequal.

There is a definite conventional position in which for purposes of description a crystal is always supposed to be held. With reference to this position one of the axes—that which is erect or most erect—is termed the "vertical," and the others the "lateral." The planes in which any two of the axes lie are called the "axial" or "diametral planes"—sometimes "sections." By these the space around the center is divided into "sectants." If there are, as is generally the case, only two lateral axes, the space is divided into eight sectants, or octants; but, if there are three lateral axes, it is divided into twelve sectants.

There are few more interesting departments of science than the relation of mineral bodies to light, and the modifications which it undergoes either when passing through them or when reflected from their surface.

Though the varieties of luster admit of no precise or mathematical determination, they are of considerable value in mineralogy. One highly important distinction founded on them is that between minerals of metallic and of non-metallic aspect of character. Transparency and opacity nearly coincide with this division—the metallic minerals being almost constantly opaque, the non-metallic more or less transparent. Minerals which are perfectly opaque, and show the peculiar brilliancy and opacity of surface of polished metals, are named metallic; those which possess these properties in an inferior degree are semi-metallic; and those without these properties are non-metallic.

Color is a property which is of very inferior value. Minerals are so seldom, if ever, absolutely pure that

very minute quantities of an intensely colored impurity may impart color to a substance inherently colorless, or overpower a feeble color which may be its own.

Streak.—This name is applied to the appearance and the color of the line or furrow produced in minerals by drawing the edge of a hard tempered knife or file along their surface, or to the stain obtained by rubbing a soft mineral on such a substance as paper or porcelain. Taken along with the hardness, which may to a certain extent be determined by the same operation, it is one of the most valuable tests which we possess.

Diaphaneity.—Minerals, and even different specimens of the same species, vary much in this quality. Some transmit so much light that small objects can be clearly seen, or letters read, when placed behind them; such are named transparent. They are semitransparent when the object is seen only dimly, as through a cloud, and translucent when the light that passes through is so broken that the form of the object can be no longer discerned; some minerals are only thus translucent on the thinnest edges. Others transmit no light and are named opaque.

Most crystals—all, in fact, except those of the cubical system—exhibit the phenomena of double refraction.

Polarization.—Intimately connected with this property is that of the polarization of light, which affords an easier means of determining mineralogical characteristics than the direct study of double refraction.

Pleochroism.—Closely connected with double refraction is that property of transparent minerals named pleochroism (of many colors), in consequence of which they exhibit distinct colors when viewed by transmitted light in different directions. Crystals of the cubic system do not show this property, while in those of the other systems it appears in more or less perfection—in tetragonal and hexagonal minerals as dichroism (two colors), in the rhombic and clinic systems as trichroism (three colors). In most cases these changes of color are not very decided, and appear rather as different tints or shades than as distinct colors. The most remarkable of dichromatic minerals are the magnesian mica from Vesuvius, the tourmaline, and ripidolite; of trichromatic, iolite, andalusite from Brazil, diaspore from Schenitz, and axinite.

Phosphorescence.—This is the property possessed by particular minerals of emitting light in certain circumstances, without combustion or ignition.

Thus some minerals appear luminous when taken into the dark, after being for a time exposed to the sun's rays or even to the ordinary daylight. Many diamonds, and also calcined barytes, exhibit this property in a remarkable degree; less so aragonite, calc-spar, and chalk. Many minerals, including the greater part of those thus rendered phosphorescent by the influence of the sun, also become so through heat. Thus some topazes, diamonds, and varieties of fluor-spar become luminous by the heat of the hand; other varieties of fluor-spar and phosphorite require a temperature near that of boiling water; while calc-spar and many silicates are only phosphorescent at from 400° to 700° Fahr.

Fluorescence is the property whereby rays of light of a refrangibility higher than those ordinarily seen by the human eye are rendered visible. The substance when placed in the violet end of the spectrum, and carried beyond it into the invisible rays, becomes luminous, through "degrading" the rays through extreme refrangibility. This property is well marked in those varieties of fluorite which are pale green by transmitted light, and deep purple by reflected light. Ozocerite and some petroleum also exhibit the property.

Electricity.—Friction, pressure, and heat may excite electricity in minerals. To observe this property deli-

cate electroscopes are required, formed of a light needle terminating at both ends in small balls, and suspended horizontally on a steel pivot by an agate cup. Such an instrument can be electrified negatively by touching it with a stick of sealing-wax excited by rubbing, or positively by merely bringing the wax so near as to attract the needle. When the instrument is in this state, the mineral, if also rendered electric by heat or friction, will attract or repel the needle according as it has acquired electricity of an opposite or of a similar kind; but if the mineral is not electric it will attract the needle in both conditions alike.

Magnetism.—This property is very characteristic of the few minerals in which it occurs—chiefly ores of iron or nickel. Some magnetic iron ores possess polar magnetism, or are natural magnets; while the common varieties of magnetic, meteoric iron, magnetic pyrites, precious garnet, and other minerals, are simply magnetic. Most minerals are only attracted by the magnet, but do not themselves attract iron.

Minerals, as other substances, have also been divided into magnetic and diamagnetic. (See MAGNETISM.)

Crystallomagnetic Action.—The magnetic polarity thus far alluded to belongs to the mass, and has no relation to crystalline form. There is also a kind of polarity directly related to the crystalline or optic axes of minerals. A crystal of cyanite, suspended horizontally, points to the north, by the magnetic power of the earth only, and is a true compass needle, from which even the declination may be obtained; and the line of direction is the line of the optic axes. Other crystals, which are called negative, take a transverse or equatorial position. The latter are diamagnetic crystals.

Conductivity for Heat.—Senarmont found that the conducting power of colloids and of crystals of the cubic system is equal in all directions, but that it varies in different directions in crystals belonging to all the other systems, exhibiting characters analogous to those deduced from their double refraction, conformable with the optic axes of the crystal, and referable, as in the latter case, to axes of elasticity, or unequal compression of the molecules.

Dilatation by Heat.—In crystals of those systems in which the molecules are arranged unequally as regards their axes, the amount of their dilatation when heated is unequal in the direction of their axes.

Hardness.—A harder body is distinguished from a softer, either by attempting to scratch the one with the other, or by trying each with a file. Each of these methods is used by the mineralogist in determining the hardness of the species, though the latter is in most cases to be preferred. Both methods should be employed when practicable.

Tenacity.—Solid minerals are said to be brittle, sectile, malleable, flexible, or elastic:

1. **Brittle**, when parts of a mineral separate in powder or grains on attempting to cut it; as baryte, calc-spar.

2. **Sectile**, when pieces may be cut off with a knife without falling to powder, but still the mineral pulverizes under a hammer; as brucite, gypsum.

3. **Malleable**, when slices may be cut off and these slices flatten out under a hammer; as native gold, native copper.

4. **Flexible**, when the mineral will bend and remain bent after the bending force is removed; as gypsum, graphite, talc.

5. **Elastic**, when after being bent it will spring back to its original position; as mica.

When the tenacity of a mineral is overcome by an overwhelming amount of traction, or its elasticity by a sudden shock, its parts are separated, either in flat and continuous surfaces, or in surfaces which are irregular

in the extreme. The first of these modes is termed cleavage, the second fracture.

The number of the parallel cleavage-planes is altogether indefinite, so that the only limit that can be assigned to the divisibility of some minerals, as gypsum and mica, arises from the coarseness of our instruments. These minima of coherence, or cleavage-planes, are always parallel to some face of the crystal; and similar equal minima occur parallel to every other face of the same form. Hence they are always equal in number to the faces of the form, and the figures produced by cleavage agree in every point with true crystals, except that they are artificial. They are thus most simply and conveniently described by the same terms and signs as the faces of crystals.

Fracture.—This is the irregular manner in which substances may be broken. Even minerals possessed of cleavage may be fractured in other directions; but in amorphous bodies fracture alone occurs. The following varieties of fracture occur, and are highly characteristic:

1. **Conchoidal**, almost typical of amorphous bodies, but occasionally seen in crystals—rounded cavities, more or less deep. The name is taken from the resemblance to the successive lines of interrupted growth in a bivalve shell. Seen in flint, obsidian, asphalt. In calcite the direction of this fracture is intermediate to the planes of the mineral's cleavage.

2. **Even**, when the surface of fracture is smooth and free from inequalities.

3. **Rough**, when the surface of fracture is rugged, with numerous small elevations and depressions.

4. **Splintery**, when covered with small wedge-shaped splinters.

5. **Hackly**, when the elevations are sharp, slightly bent, or jagged, as broken iron.

6. **Earthy**, when it shows only fine dust.

Taste belongs only to soluble minerals. The different kinds adopted for reference are as follows:

1. **Astringent**, the taste of blue vitriol.

2. **Sweetish astringent**, taste of alum.

3. **Saline**, taste of common salt.

4. **Alkaline**, taste of soda.

5. **Cooling**, taste of saltpeter.

6. **Bitter**, taste of epsom salts.

7. **Sour**, taste of sulphuric acid.

8. **Pungent**, taste of sal-ammoniac.

9. **Metallic**, taste of zinc sulphate.

Odor.—Excepting a few gaseous and soluble species, minerals in the dry unchanged state do not give off odor. By friction, moistening with the breath, and the elimination of some volatile ingredient by heat or acids, odors are sometimes obtained which are thus designated:

1. **Alliaceous**, the odor of garlic. Friction of arsenical iron elicits this odor; it may also be obtained from any of the arsenical ores or salts by means of heat.

2. **Horse-radish odor**, the odor of decaying horse-radish. This odor is strongly perceived when the ores of selenium are heated.

3. **Sulphurous**. Friction will elicit this odor from pyrites, and heat from many sulphurets.

4. **Bituminous**, the odor of bitumen.

5. **Fetid**, the odor of sulphuretted hydrogen or rotten eggs. It is elicited by friction from some varieties of quartz and limestone.

6. **Argillaceous**, the odor of moistened clay. It is obtained from serpentine and some allied minerals after moistening them with the breath; others, as pyrrargillite, afford it when heated.

7. **Empyreumatic or ozonic**. Quartz, when two portions strike one another.

Touch.—Some minerals are distinguished by a greasy feeling, as talc; others feel smooth, as celestine;

others meager, like clay; others cold. This last characteristic distinguishes true gems from their imitations in glass. Some, in virtue of their hygroscopic nature adhere to the tongue.

Influence of Chemical Composition on the External Characters of Minerals.—That the characteristics of a compound must to a certain extent depend on those of its component elements seems, as a general proposition, to admit of no doubt. Hence it might be supposed possible from a knowledge of the composition of a mineral to draw conclusions in reference to its form and its other properties; but practically this has not yet been effected.

Isomorphism.—Still more important is the doctrine of isomorphism, designating the fact that two or more simple or compound substances crystallize in one and the same form, or often in forms which, though not identical, yet approximate very closely. This similarity of form is generally combined with a similarity in other physical and in chemical properties. Among minerals that crystallize in the tesseral system, isomorphism is of course common and perfect, there being no diversity in the dimensions of the primary form; but for this very reason it is generally of less interest. It is of more importance among crystals of the other systems, the various series of which are separated from each other by differences in the proportions of the primary form. In these perfect identity is seldom observed, but only very great similarity.

MINERAL WATERS. No absolute line of demarcation can be drawn between ordinary and mineral waters. There is usually in the latter an excess of mineral constituents or of temperature, but some drinking waters contain more mineral constituents than others that are called mineral waters, and many very pure waters, both cold and warm, have been regarded for ages as mineral springs.

As to the origin of mineral waters, there is much in what the elder Pliny said, that waters are such as the soil through which they flow. Thus in limestone and chalk districts an excess of lime is usually present; and the waters of a peculiar district have much resemblance to each other—as in the Eifel, in Auvergne, and in the Pyrenees. But this is only a partial explanation, for waters are by no means necessarily uniform throughout a particular geological formation. We do not know with any certainty the depth from which various mineral waters proceed, nor the various distances from the surface at which they take up their different mineral constituents.

The source of the temperature of thermal waters remains a subject of much uncertainty. Among the assigned causes are the internal heat of the globe, or the development of heat by chemical or electrical agencies in the strata through which they rise.

Their occasional intermittence is doubtless often dependent on the periodical generation of steam, as in the case of the Geysers. A few geological facts are certain, which bear on the origin of mineral waters. Such springs are most abundant in volcanic districts, where many salts of soda and much carbonic acid are present. They occur most frequently at meetings of stratified with unstratified rocks, in saddles, and at points where there has been dislocation of strata.

The diffusion of mineral water is very extended. Pliny was quite correct in observing that they are to be found on alpine heights and arising from the bottom of the ocean. They are found at the snow in the Himalayas and they rise from the sea at Baie and Ischia. They are to be found in all quarters of the globe, but more particularly in volcanic regions, as in the Eifel and Auvergne, in the Bay of Naples, and parts of

Greece, in Iceland, New Zealand, and Japan. But there are few countries in which they are not to be found, except in very flat ones and in deltas of rivers—for instance, in the north of France, where they are very few, and in Holland, from which they are absent. France, Germany, Italy, and Spain, as well as Greece, Asia Minor, and the Caucasus, are all rich in mineral waters. The British Isles have a fair though not very large proportion of them. There are a few in Sweden and Norway. They are abundant in the United States, less so in Canada. They are found in the Azores and in the West India Islands. Of their occurrence in the interior of Africa or of Australia we know little; and the same is true of South America. But they are met with in Algiers, in Egypt, and in the Holy Land. The vast Indian peninsula has for its size a comparatively small supply. Mineral waters, when analyzed, are found to contain a great many substances, although some of them occur only in very minute quantities—soda, magnesia, calcium, potash, alumina, iron, boron, iodine, bromine, arsenic, lithium, caesium, rubidium, fluorine, barium, copper, zinc, manganese, strontium, silica, phosphorus, besides extractive matters, and various organic deposits known under the name of glairin or baregin. Of gases there have been found carbonic acid, hydrosulphuric acid, nitrogen, hydrogen, oxygen, and ammonia. Of all these by far the most important, in a therapeutic point of view, are sodium, magnesia, and iron, carbonic acid, sulphur, and perhaps hydrosulphuric acid. These substances, detected separately by chemists, are in their analyses combined by them into various salts, if not with absolute certainty, undoubtedly with a close approximation to it. Those combinations are very numerous, and some waters contain ten to twenty of them; but there are always some predominating ones, which mark their character, while many of them, such as caesium, rubidium, or fluorine, occur in mere traces, and cannot be assumed to be of any real importance. Mineral waters, therefore, resolve themselves into weaker or stronger solutions of salts and gases in water of higher or lower temperature. For medical purposes they are used either externally or internally, for bathing or for drinking. As the quantity of salts present commonly bears but a very small proportion to that of the fluid containing them, water becomes a very influential agent in mineral-water treatment, about which it is therefore necessary to say something.

It seems to be ascertained that drinking considerable amounts of cold water reduces the temperature of the body, diminishes the frequency of the pulse, and increases the blood pressure temporarily. Water when introduced into the stomach, especially if it be empty, is quickly absorbed; but, although much of the water passes into the veins, there is no proof that it ever produces in them, as is sometimes supposed, a state of fluidity or wateriness. Therapeutically, the imbibition of large quantities of water leads to a sort of general washing out of the organs. This produces a temporary increase of certain excretions, augmented diuresis, and a quantitative increase of urea, of chloride of sodium, and of phosphoric and sulphuric acids in the urine. Both the sensible and the insensible perspirations are augmented. A draught of cold water undoubtedly stimulates the peristaltic action of the intestines. On the whole water slightly warm is best borne by the stomach, and is more easily absorbed by it than cold water; and warm waters are more useful than cold ones when there is much gastric irritability.

The history of the use of mineral waters can only just be alluded to. They have been employed from the earliest period, and traces of Roman work have been

found at most of the European baths which are now in favor—at almost all the thermal ones. Occasionally new springs are discovered in old countries, but the great majority of them have been long known. They have varied in popularity, and the modes of applying them have also varied, but less so than has been the case with most of the ordinary medicines. Warm waters, and those containing small quantities of mineral constituents, appear to have remained more steadily in favor than any other class within the appropriate sphere of mineral waters, which is limited to the treatment of chronic disease.

MINERVA (*i.e.*, *menes-va*, endowed with mind) was the Roman goddess who presided over all handicrafts, invention, arts, and sciences. She was probably an Etruscan deity, but her character was modified on Roman soil through her identification with the Greek Pallas Athena (see **ATHENA**). No legend of her birth was recorded; the Roman deities were abstractions, not distinct persons with an individual history. Her chief worship in Rome was in the temple built by Tarquin on the Capitol, where she was worshiped side by side with Jupiter and Juno. The dedication day of the temple and birthday of the goddess was March 19th, and this day was the great festival of Minerva, called *quinquatrus* because it fell on the fifth day after the Ides. The number five was sacred to the goddess. All the schools had holidays at this time, and the pupils on reassembling brought a fee (*minerval*) to the teachers. In every house also the *quinquatrus* was a holiday, for Minerva was patron of the women's weaving and spinning and the workmen's craft. At a later time the festival was extended over five days, and games were celebrated.

MINGRELIA, a former principality of Transcaucasia, which became subject to Russia in 1804, and since 1867 has constituted three circles of the government of Kutais—Letchgum, Senakh, and Zugdidi. The country corresponds to the ancient Colchis; and Izgaur or Iskuriah on the Black Sea coast, which was the capital during the period of Mingrelian independence under the Dadian dynasty, is to be identified with the ancient Dioscurias, a colony of Miletus. The Mingrelians (still almost exclusively confined to the Mingrelian territory, and numbering 197,000) are closely akin to the Georgians. (See **CAUCASUS** and **GEORGIA**.)

MINIATURE is a term which by common usage has come to be applied to two different branches of painting. Derived from the Latin word *minium*, the red pigment used in the primitive decoration of MSS., in the first place it is the technical word employed to describe a painting in a MS.; and, from the fact of such pictures being executed on a reduced scale, it has its secondary and modern signification of a small, or miniature, portrait. In the latter sense it belongs to the general subject of painting.

The rise of the art of **ILLUMINATION**, in which the miniature plays so important a part, has been described under that heading; and something has been said in that place about the earliest extant specimens of miniature painting. Of Greek miniatures there are still many fine examples extant, but, excepting those which have been noticed above, there are few which are earlier than the eleventh century. At this period the miniature appears in the set form which it retained for the next two or three hundred years; and the connection between its style and that of the mosaics is too evident for us to be at a loss to explain the course of development. The figure drawing is delicate, but rather exaggerated in length; the colors are brilliant; the whole effect is heightened by glittering backgrounds of gold.

MINIMS. See **FRANCIS (ST.) OF PAOLA**.

MINING. The art of mining consists of those processes by which useful minerals are obtained from the earth's crust. This definition is wider than what is popularly known as mining, for it includes not only underground excavations but also open workings; at the same time it excludes underground workings which are simply used for passages, such as railway tunnels and sewers, and galleries for military purposes. We must remark also that the word "mine," or its equivalent in other languages, varies in signification in different countries on account of legal enactments or decisions which define it. Thus, in France and Belgium, the workings for mineral are classified by the law of 1810, according to the nature of the substance wrought, into *mines*, *minières*, et *carrières*. In the United Kingdom, on the contrary, it is the nature of the excavation which decides the question for certain legislative purposes, and the term mine is restricted to workings which are carried on underground by artificial light. The consequence is that what is merely an underground stone quarry in France becomes a true mine in England, while the open workings for iron ore, such as exist in Northamptonshire, would be true mines under the French law.

Manner in which the Useful Minerals Occur.—The repositories of the useful minerals may be classified according to their shape as (A) tabular deposits, and (B) masses.

Tabular Deposits.—These are deposits which have a more or less flattened or sheet-like form. They may be divided, according to their origin, into beds or strata, and mineral veins or lodes.

Geology teaches us that a large proportion of the rocks met with at the surface of the earth consists of substances arranged in distinct layers, owing to the fact that these rocks have been formed at the bottom of seas, lakes, or rivers by the gradual deposition of sediment, by precipitation from solutions, and by the growth or accumulation of animal and vegetable organisms. If any one of these layers consists of a useful mineral, or contains enough to make it valuable, we say that we have a deposit in the form of a bed, stratum or seam. Of course the most important of all bedded or stratified deposits is coal, but, in addition, we have beds of anthracite, lignite, iron ore (especially in the Oölitic rocks), cupiferous shale, lead-bearing sandstone, silver-bearing sandstone, diamond-, gold-, and tin-bearing gravels, to say nothing of sulphur, rock-salt, clays, various kinds of stone, such as limestone and gypsum, oil-shale, alum-shale, and slate.

The characteristic feature of a bed is that it is a member of a series of stratified rocks; the layer above it is called the *roof* of the deposit, and the one below it is the *floor*. Its *thickness* is the distance from the roof to the floor at right angles to the plane of stratification; its *dip* is the inclination downward measured from the horizontal; its *strike* is the direction of a horizontal line drawn in the middle plane.

The thickness of beds that are worked varies within very wide limits. While the thickness of certain workable beds of coal is only one foot, we find on the other hand beds of lead-bearing sandstone no less than eighty-five feet thick, and beds of slate far exceeding that thickness. It must not be supposed, however, that the thickness of a bed necessarily remains uniform. Occasionally this is the case over a very large area; but frequently the thickness varies, and the bed may dwindle away gradually, or increase in size, or become divided into two, owing to the appearance of a parting of valueless rock.

Veins or lodes are tabular or sheet-like deposits of mineral which have been formed since the rocks by which they are surrounded; they differ, therefore, by

their subsequent origin from beds, which, as just stated, are of contemporaneous origin with the inclosing rocks (although of course cases occur in which the deposit is lying unconformably upon very much older strata, or is covered unconformably by very much younger strata). It is necessary to explain that the term "vein" in this definition is used in a more restricted sense than is sometimes customary among miners, who speak of *veins* of coal, clay ironstone, and slate, which geologically are true beds. They see a band of valuable mineral or rock, and, careless of its origin, call it metaphorically a vein or seam. On the other hand, the definition is broader than that which prevails among some geologists, who would confine the term vein to deposits occupying spaces formed by fissures.

Masses are deposits of mineral, often of irregular shapes, which cannot be distinctly recognized as beds or veins. These may have been formed by the percolation of water bringing down iron in solution from overlying Triassic rocks. Examples of masses are the calamine deposits of Altenberg, Sardinia, and Lombardy, the iron ore deposits in Missouri, such as Iron Mountain and Pilot Knob, the huge upright "necks" or "pipes" of diamantiferous rock in South Africa, and the granite decomposed *in situ* worked for china clay in Cornwall. The object of the prospector is to discover valuable deposits of mineral. This search is beset with many difficulties; the outcrops of mineral deposits are frequently hidden by soil; the nature of the deposit itself is generally entirely changed near the surface; and, in addition to this, the explorer may have to pursue his work in trackless forests far away from any settlements.

The prospector seeks for natural sections of the rocks, such as occur in cliffs or in river valleys and their tributary gullies and gorges; he examines the materials constituting the river beds, often digging up and washing portions in a pan, in order to ascertain whether they contain traces of the heavy ores or metals. If, while prospecting in a valley, he discovers stones that have the appearance of having once belonged to veins, he endeavors to trace them to their source, and is perhaps rewarded by finding similar fragments, but less water-worn, as he goes up the stream; further on he may come upon large blocks of vein stuff lying about, and finally find the vein itself laid bare in a gorge, or at the bottom of a brook, or possibly projecting above the soil in the form of huge crags of quartz. Thus at the Great Western quicksilver mine in California the outcrop of the vein appears as a dike over 100 feet wide, and having precipitous sides, in places seventy-five feet high.

After having acquired an idea of the position of a vein or seam by some of the surface indications just mentioned, it is necessary, before attacking it by shafts or levels, to obtain more certain data concerning it. In the case of mineral veins, trenches are dug at right angles to the supposed strike; and when the upper part of the deposit has been cut in several places, its general course and dip can be determined sufficiently for the purpose of arranging the future workings.

Where the mineral to be wrought occurs as a bed or mass, the process of boring is resorted to, and indeed this method is also applied in the case of veins, especially in the United States.

The object of boring is to reach a deposit by a small hole and ascertain its nature, its depth from the surface, thickness, dip, and strike. Bore-holes are also used for obtaining water, brine, and petroleum, which either rise to the surface or have to be pumped up from a certain depth, and finally for tapping water in old workings or for effecting ventilation. The methods of boring may be classified as boring with the rod; boring with the rope; boring with the diamond-drill.

The kind of ground in which mining excavations have to be carried on varies within the widest limits, from loose quicksands to rocks which are so hard that the best steel tools will scarcely touch them.

Loose ground can be removed with the shovel, but in the special case of peat sharp spades are employed, which cut through the fibers and furnish lumps or sods of convenient form for drying and subsequent use as fuel. What is called *fair, soft*, or easy ground, such as clay, shale, decomposed clay-slate, and chalk, requires the use of the pick and the shovel. When the ground, though harder, is nevertheless "jointy," or traversed by many natural fissures, the wedge comes into play.

We now come to hard ground; and in this class we have a large proportion of the rocks met with by the miner, such as slate of various kinds, hard grits and sandstone, limestone, the metamorphic schists, granite, and the contents of many mineral veins. Rocks of this kind are attacked by boring and blasting. The tools employed are the jumper, the borer or drill, the hammer, the sledge (*mallet*, Cornwall), the scraper and charger, the tamping bar or stemmer, in some places the prickler or needle, the claying bar, the crowbar, and finally the shovel for clearing away the broken rock.

Holes for blasting are sometimes bored by tools like carpenters' augers. One of the simplest, which is used in some French slate-mines, is very like a brace and bit, and the tool is kept pressed against the rock by means of a screw fixed in a frame resting on the ground.

In addition to these tools the miner requires an explosive, and a means of firing the charge at the bottom of the hole which will give him time to escape. Twenty years ago gunpowder was the only explosive in common use in mines, but at the present day its place has been taken to a very large extent by mixtures containing nitroglycerin or gun cotton. The powder used for blasting in mines usually contains less saltpeter than that which is employed for sporting or military purposes.

Nitroglycerin, or glyceryl nitrate, is a light-yellow oily liquid which is very sensitive to shocks; under the action of a fulminating cap it explodes with great violence. It has been found so dangerous that its use by itself has been given up; but on the other hand the mixture of nitroglycerin and infusorial earth, called dynamite or giant powder is now one of the commonest explosives met with.

Gun cotton *per se* is not much in favor in ordinary mining; but mixed with some nitrate or mixture of nitrates, such as the nitrates of barium and potassium, and known as cotton powder, tonite, and potentite, it is employed extensively. The commonest method of firing a charge is by means of the *safety-fuse*, a cord containing a core of gunpowder introduced during the process of manufacture; it may be rendered waterproof by tar or gutta-percha. Charges may be readily fired singly or simultaneously with the aid of electricity, either of high tension obtained from a frictional, magneto-electric, or dynamo-electric machine, or of low tension from a galvanic battery. The former is preferred. One of the greatest improvements in the art of mining during the last few years has been the introduction of machinery for boring holes for blasting; most of the machines imitate percussive boring by hand, but a few rotary machines are also in use. A percussive drill or perforator consists of a cylinder with a piston to which the drill is fastened. Compressed air is made to act alternately on each side of the piston, and in this manner the drill receives its reciprocating motion. Various arrangements have been adopted for securing the automatic rotation of the drill. In some cases also the advance forward

of the machine, as the hole is deepened, is also effected automatically; but in many of the best drills this work is left to the man in charge.

As a large proportion of the expenditure in mining is for actual manual labor, it is very important that means should be taken to prevent any waste in this department. Three principles are in vogue—payment by time, by work done either measured or weighed, and by the value of the ore extracted.

The overseers, called captains in many metal mines, are naturally paid by the month, and where strict supervision can be exercised, such as is possible at the surface, on the dressing-floors for instance, the same principle may be adopted; but when men are working underground, and often in small gangs of only two or three persons at some distance apart, piecework of some kind is more economical and satisfactory in every way.

In driving levels and sinking shafts it is usual for the men to work at a certain price per running yard or fathom. The agents have to see that the excavation, whether shaft or level, is maintained of the full dimensions agreed upon, and preserved in the proper direction. At the end of a certain time, generally a month, the work is measured by the agent. From the gross amount obtained by multiplying the price by the number of fathoms driven or sunk it is necessary to deduct the cost of the materials supplied to the men by the mining company, such as explosives, steel, candles, etc., and the remainder is divided among the persons who took the contract. When the useful mineral is being obtained the men may be paid at so much per cubic yard or fathom excavated, or at so much per ton of mineral extracted; the overseer of course has to see, in this latter case, that worthless rock is not sent to the surface. Payment by the number of inches bored is a method in used in some countries, where the men are not experienced or enterprising enough to undertake the work in any other way. A foreman points out to the men the position and direction in which the holes must be bored, measures them when completed, and subsequently charges and fires them.

The third method is that which is known as the tribute system. The miner working on tribute is allowed to speculate upon the value of the ore in a certain working area assigned to him and called his *pitch*. He gives the mining company all the ore he extracts at a certain proportion of its value, after he has paid all the cost of breaking it, hoisting it to the surface, and dressing it. The following kinds of timber are those most frequently employed for securing excavations underground: oak, larch, pitch pine, spruce fir, and acacia. In many mines the timber is attacked by dry rot, which gradually renders it useless and when the timber has often to be renewed the expense may be very considerable. Various methods of preventing dry rot have been tried with more or less success, such as letting water trickle over the timber in the mine or treating it with preservative solutions beforehand.

The deposit must first of all be reached by a shaft, or, where the contour of the country permits it, by a level. In the case of a vein an exploratory shaft is often sunk on the course of the lode for twenty or thirty fathoms, and, if the indications found in a level driven out from this shaft warrant further prosecution of the mine, a first working shaft is sunk to intersect the lode at a depth of 100 fathoms or more from the surface. Crosscuts are then driven out at intervals of ten, fifteen, or twenty fathoms to reach the lode. Sometimes the main shafts are carried down all the way along the dip of the deposit, though perpendicular shafts have the advantages of quicker and cheaper

winding and cheaper pumping, to say nothing of the possibility of utilizing the cages for the rapid descent and ascent of the miners. If an inclined shaft appears to be advisable, great care should be taken to sink it in a straight line. In either case levels are driven out along the strike of the lode, in the hopes of meeting with valuable ore bodies. For the purpose of affording ventilation, and still further exploring the ground and working it, intermediate shafts, called *winzes* (Cornwall) or *sumps* (North Wales), are sunk in the lode. After the mineral has been broken down in a deposit it is necessary to pick out any barren rock and then convey to the surface all that is of value.

The simplest and oldest method of transport along underground roads is carriage on the back, and this method may still be seen at the present day even in countries where the art of mining is generally highly advanced. Sledges, or *sleds*, enable greater loads to be transported; but they are not available unless the conveyance is along roads sloping downward. They have been largely employed in coal mines, and are still resorted to in some collieries for conveying the coal from the working place to the nearest tram-road.

We next come to wheeled carriages. The simplest is the wheelbarrow. The barrow used in Cornwall at the present day is not unlike that figured by Agricola. The navy's barrow is more advantageous, but it requires a wider and higher level. The barrow runs upon the natural floor of the level, upon boards, or upon thin strips of iron. Carts drawn by horses may be used in large underground quarries. Excepting in special cases it is advisable to replace barrows by wagons running upon rails. The oldest form is the German *Hund*. It consists of a rectangular wooden body, with four wheels, resting upon two boards as rails, and it is kept on the track by a pin which runs between the boards. Cast-iron tram-plates were introduced in the last century, and were finally succeeded by iron rails, which are now in general use, though steel threatens to displace iron in this as in other departments of mining.

The form and size of the wagons running upon the rails necessarily vary according to the size of the underground roads and the manner in which the mineral is raised in the shaft. The most modern system in metal mines is to imitate collieries, and use wagons which are drawn up in cages.

In beginning to sink a shaft from the surface, or in sinking a winze, hand-power applied by a windlass is sufficient. The broken rock at the bottom of the shaft is shoveled into a wooden or iron bucket, which is drawn up by a rope passing round the barrel of the windlass. When a depth of twenty or thirty yards has been reached it is more advantageous to introduce horse-power, and the usual machine by which this power is applied, called a *gin* or *horse-whim*, is a common sight in many metalliferous districts. Where steam and water-power are not available, a large number of horses or mules are sometimes harnessed to whims, and ore raised from depths of 200 fathoms. These, however, are exceptional cases; and, especially since the introduction of portable engines, the use of steam-power even for comparatively small depths, such as 100 yards, is daily increasing. In hilly districts water-power is generally at hand, and huge reservoirs are frequently constructed for storing the rainfall, and so affording an adequate and constant supply. It may be utilized by water-wheels, turbines, and water-pressure engines.

The mineral having been raised to the surface, the task of the miner might appear to be at an end; but this is not the case, for it is further necessary that he should keep his mine free from water and foul air. These two

indispensable operations of draining and ventilating frequently require special appliances which add considerably to the general cost of mining.

In all cases where it is possible, endeavors should be made to keep the water out of a mine, so as to save the expense of pumping it; and the method of putting in a watertight lining (*tubbing*) in a shaft has been already described (see COAL). When large streams of water happen to be intersected by underground workings, and threaten to overpower the available pumping machinery, or when it is advisable to save the expense of draining abandoned workings, the entry of this water into the mine may often be prevented by stoppings, called *dams*, constructed of timber or brickwork.

In spite of all precautions, the miner generally has to contend with water which percolates into the workings. Four methods of getting rid of this water are available, viz., adits, siphons, winding machinery, and pumps.

An adit, day-level, or sough is a nearly horizontal tunnel with one end opening at the surface, allowing the water to drain away naturally. In hilly countries mines are often worked entirely by adits, and even when a mine is deepened below the drainage level the utility of the adit is still threefold—it lessens the quantity of water which tends to percolate into the lower workings; it lessens the depths to which the water has to be pumped; and, by furnishing a certain amount of fall, it enables water to be applied as power. On account of these important advantages some very long and costly adits have been driven for the purpose of aiding the miners in certain metalliferous districts.

In the United States the famous Sutro tunnel is an adit of which the main branch, four miles in length, reaches the great Comstock lode in Nevada at a depth of 1,700 feet. The total cost of this tunnel, which was completed in nine years, is estimated to have been \$7,000,000. The quantity of water running out daily in 1879 was 12,000 tons, at a temperature of 123° Fahr. at the mouth of the tunnel. All this water must otherwise have been pumped to the surface at a cost estimated at \$3,000 a day. The obstacles to progress were very great; not only was the heat extreme, but swelling ground was encountered which snapped the strongest timber.

Siphons have been used for unwatering workings in special cases; but, of course, they will not act unless the barrier over which the water is raised is very decidedly less than thirty-three feet. When workings cannot be drained by tunnels or siphons it is necessary to raise the water mechanically, either to the surface or at all events to an adit through which it can flow away naturally. If the amount of water is not too considerable, it is often convenient to use the winding machinery and draw up the water in special buckets (*water-barrels*) or tanks. The bucket may be tilted over on reaching the surface, or it may be emptied by a valve at the bottom. This means of raising water is often adopted while sinking shafts, when it may be desirable to wait till the whole or a portion of the shaft is completed before putting in the final pumping machinery.

The varieties of pumps used in mines are numerous. In small sinkings hand-pumps, either direct-acting or rotary, may be applied; steam-jet pumps on the principle of the Giffard injectors are also used; and pulsometers, though requiring a large expenditure of steam, have the advantages of being quickly fixed, of occupying little space, and of working with sandy or muddy water. They are capable, therefore, of rendering great services in special cases. When we come to the definitive machinery erected in large mines of considerable depth, we

find that the prevailing types of pumps are few. They may be classified as follows: Lifting and force pumps worked by rods in the shaft actuated by wind, water, or steam power; force-pumps at the bottom of the shaft worked by steam, compressed air, or hydraulic pressure.

The composition of the air of the atmosphere is about one-fifth by volume of oxygen and four-fifths of nitrogen, with a little carbonic acid gas; more exactly, the standard amount of oxygen may be taken at 20.9 per cent., and that of the carbonic acid gas at 0.03 per cent. The atmosphere of mines is subject to various deteriorating influences; not only do noxious gases escape from the rocks into the underground excavations, but also the very agents employed in the execution of the work itself pollute the air considerably.

The dangerous emanations of fire-damp in collieries have been already described (see COAL); and with reference to this gas it is simply necessary to say that its presence is not entirely confined to coal mines. Large quantities have been observed in Silver Islet mine, Lake Superior, where several explosions have occurred, while small quantities are met with in the stratified ironstone of Cleveland, and also in the Cheshire salt mines; jets of the gas may be seen constantly burning in the salt mine at Bex in Switzerland; a little has been noticed also in lead mines in Wales and Derbyshire. In the Sicilian mines the amount given off by the black carbonaceous shales interstratified with the sulphur beds is sufficient to cause dangerous explosions. It has been pointed out that carbonic acid gas exudes from coal; it escapes also from some mineral veins. At the lead mines of Pontgibaud in central France it is so abundant that special fans have to be provided for getting rid of it; very distinct issues of this gas may be observed at the Foxdale mines in the Isle of Man, and in the Alston Moor district it is not uncommon. This gas is likewise given off in the Sicilian sulphur mines, where also the highly poisonous sulphuretted hydrogen is of frequent occurrence, the water in the workings being often saturated with it. Small quantities of mercurial vapor occur in quicksilver mines.

Having explained the reasons why the air of mines must be constantly renewed, we must now point out how this desirable end is effected.

Two systems are employed—natural ventilation and artificial ventilation; but, as both systems have been described (see COAL), little remains to be said here, especially as the ventilating machines in metalliferous mines generally cannot for one moment be compared with the powerful appliances employed in collieries. In vein-mining there are generally many more shafts than in collieries, and natural currents are set up which are often considered sufficient for ventilating the mines; nevertheless, the advanced workings, such as the ends, rises, and winzes—in fact all workings in the form of a *cul-de-sac*—are likely to require special means of ventilation as soon as they proceed a little distance from the main air-current.

Mines are lighted by lamps, torches, candles, and electricity. The subject of safety lamps for fiery mines has already been discussed (COAL), and consequently the question of illuminating mines may be treated in a very summary manner.

Lamps vary very much in shape and size. The Sicilian miner has a mere shallow cup of unglazed pottery, the Saxon a small tin or brass lamp in a wooden box lined with tinfoil and open in front. In the Harz the miner prefers a heavy flat iron lamp with a hook by which it is stuck into the timber or any crack in the rocks; in France, northern Italy, and parts of Spain, the iron lamp is lenticular in shape and also suspended by a hook. In Scotland, and parts of Germany and the

United States, a small tin lamp of the shape of a coffee pot is very common.

The miners of England and Wales still cling to the tallow candle; and when surrounded by a lump of clay it can easily and quickly be fixed in the working place or carried upon the hat when climbing. Gas brought down from the surface answers for illuminating large excavations, such as on-setting places and engine-rooms.

Up to the present time the electric light has been but little used underground on account of its want of portability, and the smallness of the spaces requiring illumination.

Among the first successful applications of electric lighting to underground excavations may be mentioned that of M. Blavier at the Angers slate quarries. The large chambers in the salt mine of Maros-Ujvár in Hungary have been regularly lighted up by electricity since 1880.

Where mines are worked by adit-levels the men naturally walk in along the ordinary roadways; such mines, however, are exceptional, and the men generally have to climb down and up by ladders, or are raised and lowered by machinery. The means of access to and from workings may be classified as follows:—(1) steps and slides; (2) ladders; (3) cages; (4) man-engines.

Ladders are very largely used in metal mines all over the world, but they vary a good deal in different countries. In many cases sufficient attention is not paid to the angle of inclination of the ladders. A ladder is climbed with the least fatigue when the person uses his arms simply to steady himself, and is not compelled to pull himself up by them, as on a vertical ladder, or to support much of the weight of his body by them, as happens with a very flat one. The best angle is about 20° from the vertical, and in Belgium the authorities have very wisely decreed that no ladder shall be inclined at an angle of less than 10° from the vertical. In collieries and other mines worked by perpendicular shafts, it has long been customary to raise and lower the men by the ordinary winding machinery already described.

The first man-engine was put up in the Harz in 1833, and nine years later a similar machine was fixed in Tresavean mine in Cornwall. Since that time this very useful means of conveying workmen up and down shafts has been resorted to in other mining districts, and especially in Belgium and Westphalia.

In a large number of cases the mineral, as it is raised from the mine, is not ready for sale. It usually requires to be subjected to mechanical processes whereby the good ore is entirely or partly freed from valueless vein-stone. These processes, which in a few special instances are aided by calcination in furnaces, are known as the dressing or mechanical preparation of the ores. As a rule the valuable ore is specifically heavier than the vein-stone, and most of the separating processes are based upon the fact that the heavy particles of ore will fall in water more quickly than the light particles of vein-stone.

The processes of mechanical preparation may be classified as follows:—(1) washing and hand-sorting; (2) disintegration, or reduction in size; (3) classification by size or by equivalence; (4) concentration.

(1) Sometimes the ore coming from the mine requires simply to be freed from adhering particles of clay in order to be rendered fit for sale, at other times the washing is necessary as a preliminary process previous to sorting by hand. The operation is performed either by raking the ore backward and forward upon a grating under a stream of water, or in a box containing water, or, thirdly, by means of an inclined revolving iron drum worked by hand or any other motive power. The machines used for this purpose, known as washing trom-

mels, are revolving cylinders or truncated cones of sheet-iron provided with teeth inside. The ore is fed in at one end, is subjected to the action of a stream of water, and is discharged at the other end. The *stuff*, i.e., the mixed ore, veinstone, and country rock, having been cleansed, it is now possible to make a separation by hand. Women and children are generally employed for this work, as their labor is cheaper and their sight sharper than that of men. The stuff is spread out on a table, and various classes are picked out according to the nature of the products furnished by the mine.

(2) Reduction in size is necessary for two reasons. Even when an ore is sufficiently clean for the smelter, the large lumps are often crushed by the miner for the sake of obtaining a fair sample of the whole, or supplying a product which is at once fit for the furnace. The chief reason, however, for disintegration lies in the fact that the particles of ore are generally found inclosed in or adhering to particles of barren veinstone.

The disintegration is effected by hand or by machinery. Large blocks of ore and veinstone are broken by men with large sledge hammers, and the reduction in size is continued very often by women with smaller hammers. Sometimes the blow of the hammer is directed so as to separate the good from the poorer parts, and hand-picking accompanies this process, called *cobbing*. Ore may be crushed fine by a flat-headed hammer (*bucking iron*) on an iron plate.

The machines used for reducing ores to smaller sizes are very numerous; those most commonly used are stone-breakers, stamps, rolls, mills, and centrifugal pulverizers.

(3) Classification of a crushed ore into sizes is absolutely necessary in some cases and advisable in others, because the subsequent concentration is dependent upon the fall of the particles in water, as will be presently explained. Classification by size is effected by sieves. Hand sieves and flat sieves placed one above the other have been superseded at most dressing establishments by cylindrical or conical revolving screens known as trommels. These screens are made of wire web or of perforated sheets of metal, and they are often arranged so as to discharge one into the other, so that the ore from a crusher can quickly be separated into classes of various sizes.

With sizes of less than one millimeter ($\frac{1}{64}$ inch) trommels are no longer employed, and recourse is had to the so-called separators or classifiers. These are boxes in the shape of inverted cones or pyramids into which the finely crushed ore is brought by means of a current of water; a jet of clean water is often made to rise up in the bottom; the larger and the specifically heavier particles fall and are discharged with a stream of water at or near the bottom, while the smaller and specifically lighter particles flow away at the top. The separators do not effect a true classification by size; they merely cause a division by *equivalence*, a term which will be explained immediately.

(4) We now have to deal with the enriching of the ore, or the concentration of the valuable particles into as small a bulk as is economically advantageous. The concentration is generally brought about by the fall of the particles in water. Occasionally the fall in air is utilized; mercury is employed as a collecting agent in the case of gold and silver, and in a few instances magnetism can be applied.

The concentration of water depends upon the difference in specific gravity of the valuable ore and the waste veinstone or rock. A piece of galena with a specific gravity of 7.5 sinks to the bottom more quickly than a similar piece of quartz, the density of which is only 2.6. Nevertheless a large piece of quartz may fall to the bot-

tom as quickly as a small piece of galena. Particles which have equal velocities of fall, though differing in size and specific gravity, are said to be *equal-falling* or *equivalent*. Consequently, before we can separate properly by water it is necessary to classify the particles by size, so that equivalence shall not prevent a separation or lessen its sharpness. It is nevertheless true that in the early part of the fall of equivalent grains the influence of the specific gravity preponderates, and the denser particles take the lead; therefore, by a frequent repetition of very small falls, particles which have not been closely sized may still be separated.

The principal machine for concentrating particles of sizes ranging between one inch and one-fiftieth inch is the jig or jigger. The hand jigger is merely a round sieve which is charged with the crushed ore and then moved up and down in a tub full of water. The particles gradually arrange themselves in layers, the heaviest on the bottom and the lightest at the top. On lifting out the sieve the light waste can be skimmed off with a scraper, leaving the concentrated product below ready for the smelter or for further treatment. Similar sieves worked by machinery were for a long time employed in dressing establishments, but the introduction of the improved continuous jiggers has led to their abandonment in all work of any importance. The continuous jigger is one of the most useful dressing machines of the present day.

The principal machines for concentrating fine sands and slimes are the frame, rotating frame, percussion frame, side-blow percussion frame, revolving belt and Frue vanner, the hand buddle, the round buddle, and the keeve.

The principal improvements that have been made in metal-mining during the last quarter of a century are as follows: Diamond-drill for prospecting; machine drills for driving, sinking, and stoping; use of compressed air for winding underground; stronger explosives, especially the nitro-glycerine compounds, dynamite, and blasting gelatine; increased use of steel for various purposes; Blake's stone-breaker and continuous jiggers; extended application of hydraulic mining; larger employment of electricity both for blasting purposes and for signaling by telegraph and telephone. It may be reasonably hoped that ere long electricity will render increased services to the miner for lighting the workings and for the transmission of power.

(4) Mining is one of the occupations that may decidedly be called hazardous. This fact has been thoroughly impressed upon the public mind by explosions of fire-damp in collieries; but, though accidents of this kind are appalling, owing to the number of victims who perish at one time, fire-damp is by no means the worst enemy with which the miner has to contend. Falls of roof and sides in both collieries and metal mines are far more fatal in their results.

United States.—The mineral wealth of the United States is admirably summed up by Mr. Richard P. Rothwell in his address to the American Institute of Mining Engineers. "*Production of Coal, Metal, and Petroleum in 1900.*"

"Anthracite	52,131,212 tons (Metric tons).
Bituminous coal.....	191,256,216 " "
Iron ore.....	26,332,071 " "
Lead.....	250,301 " "
Copper.....	272,536 " "
Quicksilver.....	967 " "
Gold.....	\$78,159,674 (= 3,781,310 oz.).
Silver.....	\$36,576,900 (= 59,561,797 oz.).
Petroleum, crude..	62,538,544 barrels (of 42 gallons).

"The statistics of other useful minerals and metals show an equally marvelous advance during the past thirty years. The production of pig iron, which in 1852

was 541,000 net tons, in 1896 was 8,761,197 tons. Four years later, in 1901, we produced no less than 14,099,870 tons, an increase in thirty years of nearly 800 per cent.

"Lead, which appears at 14,400 tons in 1852, varied but little from that figure until the construction of railroads into the argentiferous lead-mining districts of the west about 1870. Eureka, Nevada, Utah, and more recently Colorado, with its Leadville bonanzas, rapidly raised the production from 18,000 tons in 1871 to 47,000 tons in 1873, 75,000 tons in 1877, and 304,392 tons in 1899.

"Our production of copper steadily increased from 1,000 tons in 1852 to 269,016 tons in 1899—the enormous output of that unrivaled mine Calumet and Hecla steadying the production and neutralizing the fluctuations of the lesser mines.

"Quicksilver has shown wide fluctuations, due more to trade combinations than to the condition of the mines. In 1852 the output amounted to 20,000 flasks; but it went as low as 10,000 flasks in 1860, and rose to 53,000 flasks five years later; from this it declined to 15,000 flasks in 1875, though in the following year it grew to 75,000 flasks. Last year we produced 59,000 flasks.

"Gold is the valuable metal in which our production has been expanding. In 1880 it amounted to \$36,000,000; but, with some fluctuations, it has now (1900) advanced to almost \$80,000,000.

"The production of silver, in the same way, has largely increased. Commencing in 1859 with \$100,000, it has now (1900) attained \$57,647,000. In 1892 only were these figures exceeded, and then by about \$6,000,000.

"The production of petroleum, that great American industry, has grown with wonderful rapidity. In 1859 it commenced with only 3,000 barrels, and, after an almost uniform increase, it attained (1900) the enormous figures of 57,070,000 barrels. Scientific investigation has recently raised a note of warning in this industry, asserting the limited area of oil-producing territory and its approaching exhaustion."

The gold and silver output for the year 1900 in the United States is summed up as follows:

	GOLD.		SILVER.		TOTAL.
	Ounces.	Value.	Ounces.	Value.	Value.
Deep mines.....	1,033,974	\$21,374,152	31,717,297	\$41,007,296	\$ 62,381,443
Placers.....	580,767	12,005,511	80,177	103,661	12,109,172
All mines.....	3,829,897	\$79,171,000	57,647,000	\$35,741,000	\$114,912,000

The greatest gold producer among the States and Territories is California, with a value produced in the state and deposited at mints and Assay offices from their organization up to the year 1901 to the extent of \$787,459,956, half from deep mines and half from placers. Next follows Montana, with \$86,025,866 value of gold, of which only about 1 per cent. came from placer mines; then Colorado, with \$86,774,856, nearly entirely produced by deep mines; and in the fourth rank South Dakota (\$77,967,560), with a placer production of less than 5,000 ounces. After these come Nevada, with a total gold product, as above, of \$43,975,010; Idaho, with an aggregate value of \$41,598,137; and Oregon, with a total during the year of \$26,849,855.

The greatest silver producer since the organization of the mint and Assay offices up to the year 1901 (June 30) is Nevada (valued at \$105,700,366); then Colorado (\$25,134,885); then Montana (\$22,457,064); then Utah (\$19,992,355); and fifthly Arizona (value, \$14,193,889).

It is useless within the limits of this article to attempt to convey an adequate idea of the enormous mineral resources of the United States. We can merely very briefly allude to some of the principal deposits, which are of commercial value on account of their magnitude, of scientific interest owing to their mode of occurrence, and of technical importance as having led to the introduction of considerable improvements in the arts of mining, milling, and dressing.

Among these may be mentioned the coal and anthracite mines and oil wells of Pennsylvania, the gold and quicksilver mines of California, the silver mines of Nevada, the lead and silver mines of Colorado, and the copper mines of Lake Superior. The articles COAL and GOLD may be referred to for information concerning the occurrence of these minerals and the method of extracting gold by hydraulic mining and improved stamping machinery.

Quicksilver in the form of native mercury and cinnabar occurs in considerable abundance in California, and much of it is found in connection with serpentine, either in the serpentine itself or in sandstone near its junction with serpentine. The most important mines are those of New Almaden in the southern part of the State near San Jose. The deposit at Sulphur Bank in Lake County is of much geological interest. It consists of native sulphur, gypsum, and cinnabar in a decomposed andesitic lava close to an extinct geyser from which boiling water still issues. The top of the bank was worked open-cast for sulphur, and then for sulphur and cinnabar, and now underground mining is carried on in stratified sandstone and shale impregnated with cinnabar and underlying the lava.

Some of the most marvelous silver mines in the world are those upon the Comstock lode in Nevada. The strike is nearly north and south, and the dip about 43° to the east. "The vein matter of the Comstock consists of crushed and decomposed country rock, clay, and quartz." "Up to January 1, 1880, the Comstock had yielded in twenty years about \$325,000,000 worth of bullion. The total length of shafts and galleries is about 250 miles. The number of men employed in the mines in January, 1880, was 2,800, earning average wages of \$4 a day. At the same date 340 men were at work in the amalgamating mills." The heat of the Comstock lode is remarkable. On the 2,700 feet level of the Yellow Jacket mine Mr. Becker found the temperature of the water to be 153° , that of the air 126° ; while the water in the Yellow Jacket shaft at a depth of 3,065 feet has a temperature of 170° Fahr. During the last few years the Comstock lode almost entirely fell off in productiveness. In 1876 the total yield of the Comstock lode was \$38,572,984 (gold, \$18,002,906; silver, \$20,570,078). During the census year ending May 31, 1880, the product of the whole Comstock district, including outlying veins, was \$6,922,330 (gold, \$3,109,156; silver, \$3,813,174), showing a decline of \$31,650,654, or 82.06 per cent., since 1876.

Though the extraction of silver from its ores may be regarded as the business of the metallurgist rather than of the miner, we must not forget to mention that it is to the necessities of the treatment of the Nevada ores that we owe the system of pan amalgamation first developed in that State and practiced since in Colorado.

Another district in Nevada which cannot be passed over in silence is that which contains the Eureka and Richmond mines, which are celebrated, not only for the silver they have produced, but also for the important trial in which the issue hinged upon the definition of the term vein or lode. The bullion produced in the Eureka district from ore raised and treated during the census year ended May 31, 1880 was—gold, 62,893 ounces;

and silver, 2,037,666 ounces; worth altogether \$3,934,621.

The history of Leadville in Colorado seems like a romance when we read of the rapid development of the mines, the creation of a large and important town, the erection of smelting works and the building of railways, under very adverse conditions, in the heart of the Rocky mountains, all within the space of four or five years. It affords additional proof that the miner is the true pioneer of civilization.

The principal deposits of the region are found at or near the junction of the porphyry with the blue limestone, which is the lowest member of the Carboniferous formation. This bed is about 150 or 200 feet thick, and consists of dark blue dolomitic limestone. At the top there are concretions of black chert. The porphyry occurs in intrusive sheets which generally follow the bedding, and almost invariably a white porphyry is found overlying the blue limestone. This porphyry is of Secondary age; it is a white homogeneous-looking rock, composed of quartz and feldspar of even granular texture, in which the porphyritic ingredients, which are accidental rather than essential, are small rectangular crystals of white feldspar, occasional double pyramids of quartz, and fresh hexagonal plates of biotite or black mica. Along the plane of contact with the porphyry the limestone has been transformed, by a process of gradual replacement, into a vein consisting of argenteriferous galena, cerussite, and cerargyrite mixed with the hydrous oxides of iron and manganese, chert, granular cavernous quartz, clay, heavy spar, and "Chinese talc," a silicate and sulphate of alumina. The vein seems to have been formed by aqueous solutions, which took up their contents from the neighboring eruptive rocks and brought about the alteration of the limestone as they percolated downward through it. In Carbonate Hill, a gradual passage may be observed from dolomite into earthy oxides of iron and manganese. The masses of workable ore are extremely irregular in shape, size, and distribution. They are often thirty to forty feet thick vertically, and occasionally eighty feet, but only over a small area. The rich ore bodies are commonest in the upper part of the ore-bearing stratum.

The official reports of the director of the United States Mint show that in 1900 the total production in the United States was, of gold, \$78,159,674; of silver, \$36,576,900. During the sixty years, 1840–1900, inclusive, the total production of gold was \$2,049,854,219; of silver, \$812,392,172; a grand total of \$2,862,246,391.

The most important copper mines of the United States are those on Lake Superior, where the native metal occurs "in veins, in large masses, or scattered more or less uniformly in certain beds which are either amygdaloid or conglomerates." The principal copper-producing districts are in Michigan, where the Portage Lake district, in Houghton county, contains the famous Calumet and Hecla mine, which alone produced 15,837 tons of copper in 1880, or about half the entire output of the United States. The deposit from whence this vast amount of copper was obtained is a bed of conglomerate, generally called a vein, dipping about 38° northwest. It has been worked for a depth of 2,250 feet on the incline. In 1875 the stuff stamped yielded $4\frac{1}{2}$ per cent. of copper.

In conclusion, we will point out that the value of the mining industry in the United States exceeds that of any other country in the world, the estimate of the entire mineral products for 1899–1900 being \$1,269,243,644, and that of Great Britain \$1,333,162,150.

MINISTRY. Ever since the introduction of monarchical institutions into England the sovereign has always been surrounded by a select body of confidential advisers

to assist the crown in the government of the country. At no period could a king of England act, according to law, without advice in the public concerns of the kingdom; the institution of the crown of England and the institution of the privy council are coeval. At the era of the Norman Conquest, the king's council, or as it is now called the privy council, was composed of certain select members of the aristocracy and great officers of state, specially summoned by the crown, with whom the sovereign usually advised in matters of state and government. In the earlier stages of English constitutional history the king's councilors, as confidential servants of the monarch, were present at every meeting of parliament in order to advise upon matters judicial in the House of Lords; but in the reign of Richard II. the privy council dissolved its judicial connection with the peers and assumed an independent jurisdiction of its own. It was in the reign of Henry VI. that the king's council first assumed the name of privy council, and it was also during the minority of this sovereign that a select council was gradually emerging from out of the larger body of the privy council, which ultimately resulted in the institution of the modern cabinet. Since the Revolution of 1688, and the development of the system of parliamentary government, the privy council has dwindled into comparative insignificance when contrasted with its original authoritative position. The power once wielded by the privy council is now exercised by that unrecognized select committee of the council which we call the cabinet. The practice of consulting a few confidential advisers instead of the whole privy council had been resorted to by English monarchs from a very early period; but the first mention of the term cabinet council in contradistinction to privy council occurs in the reign of Charles I., when the burden of state affairs was intrusted to the committee of state which Clarendon says was erroneously called the "cabinet council." At first government by cabinet was as unpopular as it was irregular. Until the formation of the first parliamentary ministry by William III. the ministers of the king occupied no recognized position in the House of Commons; it was indeed a moot point whether they were entitled to sit at all in the lower chamber, and they were seldom of one mind in the administration of matters of importance. Before the Revolution of 1688 there were ministers, but no ministry in the modern sense of the word; colleague schemed against colleague in the council chamber, and it was no uncommon thing to see ministers opposing one another in parliament upon measures that ought to have been supported by a united cabinet. As the exchange from government by prerogative to government by parliament, consequent upon the Revolution of 1688, developed, and the House of Commons became more and more the center and force of the state, the advantage of having ministers in the legislature to explain and defend the measures and policy of the executive government began gradually to be appreciated. The public authority of the crown being only exercised in acts of administration, or, in other words, through the medium of ministers, it became absolutely necessary that the advisers of the sovereign, who were responsible for every public act of the crown as well as for the general policy they had been called upon to administer, should have seats in both Houses of Parliament. The presence of ministers in the legislature was the natural consequence of the substitution of government by parliament for the order of things that had existed before 1688. Still nearly a century had to elapse before political unanimity in the cabinet was recognized as a political maxim. From the first parliamentary ministry of William III. until the rise of the second Pitt divisions in the cabinet were constantly occurring and a prime minister had more to

fear from the intrigues of his own colleagues than from the tactics of the opposition. In 1812 an attempt was made to form a ministry consisting of men of opposite political principles, who were invited to accept office, not avowedly as a coalition government, but with an offer to the Whig leaders that their friends should be allowed a majority of one in the cabinet. This offer was declined on the plea that to construct a cabinet on "a system of counteraction was inconsistent with the prosecution of any uniform and beneficial course of policy." From that date it has been an established principle that all cabinets are to be formed on some basis of political union agreed upon by the members composing the same when they accept office together. It is now also distinctly understood that the members of a cabinet are jointly and severally responsible for each other's acts, and that any attempt to separate between a particular minister and his colleagues in such matters is unfair and unconstitutional.

The leading members of an administration constitute the CABINET, (*q. v.*)

During the present century the power of ministers has been greatly extended, and their duties more distinctly marked out. Owing to the development of the system of parliamentary government, much of the authority which formerly belonged to English sovereigns has been delegated to the hands of responsible ministers. As now interpreted, the leading principles of the British constitution are the personal irresponsibility of the sovereign, the responsibility of ministers, and the inquisitorial power of parliament. At the head of affairs is the prime minister, and the difference between theory and practice is curiously exemplified by the post he fills. The office is full of anomalies. Like the cabinet council the prime minister is unknown to the law and the constitution, for legally and according to the fictions of the constitution no one privy counselor has as such any superiority over another, yet practically the premier is the pivot on which the whole administration turns. He is the medium of intercourse between the cabinet and the sovereign; he has to be cognizant of all matters of real importance that take place in the different departments so as to exercise a controlling influence in the cabinet; he is virtually responsible for the disposal of the entire patronage of the crown; he selects his colleagues, and by his resignation of office dissolves the ministry. No prime minister could carry on the government of the country for any length of time who did not possess the confidence of the House of Commons; and royal favor, if it were ever invidiously exercised, would ultimately have to yield to a regard for the public interests. As a general rule the prime minister holds the office of first lord of the treasury, either alone or in connection with that of chancellor of the exchequer.

In the United States the members of the cabinet are the heads of various departments of state, nominated by the president and confirmed by the Senate. The cabinet officers are the secretary of state (foreign affairs), secretary of the treasury, secretary of war, secretary of the navy, secretary of the interior, postmaster-general, attorney-general, and secretary of agriculture. Unlike the English ministers, who must have a seat in one or other branch of the legislature, the members of the president's cabinet cannot sit in either the Senate or the House of Representatives, and if they are members of either resign on being called to the cabinet. Strictly speaking, the cabinet officers are only chiefs of departments and as such they are legally recognized. In effect they have a position nearly analogous to that of their English compeers. The system of a cabinet of heads of departments acting under the

leadership of some one distinguished member, and, as a rule, amenable to the popular representative house is common to all constitutionally-governed countries.

MINK. The genus *Putorius*, belonging to the family *Mustelidae* or weasel-like animals, contains a few species called minks, distinguished from the rest by slight structural modifications, and especially by semi-aquatic habits. They form the subgenus *Lutreola* of Wagner, the genus *Vison* of Gray. They are distinguished from the polecats, stoats, and weasels, which constitute the remainder of the group, by the facial part of the skull being narrower and more approaching in form that of the Martens, by the premolar teeth (especially the first of the upper jaw) being larger, by the toes being partially webbed, and by the absence of hair in the intervals between the naked pads of the soles of the feet. The two best-known species, so much alike in size, form, color, and habits that although they are widely separated geographically some zoologists question their specific distinction, are *P. lutreola*, the *Nörz* or *Sumpftotter* (marsh-otter) of eastern Europe, and *P. vison*, the Mink of North America. The former inhabits Finland, Poland, and the greater part of Russia, though not found east of the Ural mountains. The latter is found in places which suit its habits throughout the whole of North America. In size it much resembles the English polecat—the length of the head and body being usually from fifteen to eighteen inches, that of the tail to the end of the hair about nine inches. The female is considerably smaller than the male. The tail is bushy, but tapering at the end. The ears are small, low, rounded, and scarcely project beyond the adjacent fur. The pelage consists of a dense, soft, matted under fur, mixed with long, stiff, lustrous hairs on all parts of the body and tail. The gloss is greatest on the upper parts; on the tail the bristly hairs predominate. Northern specimens have the finest and most glistening pelage; in those from southern regions there is less difference between the under and over fur, and the whole pelage is coarser and harsher. In color, different specimens present a considerable range of variation, but the animal is ordinarily of a rich dark brown, paler below than on the general upper parts; but the back is usually the darkest, and the tail is nearly black. The under jaw, from the chin about as far back as the angle of the mouth, is generally white. In the European Mink the upper lip is also white, but, as this occasionally occurs in American specimens, it fails as an absolutely distinguishing character. Besides the white on the chin, there are often other irregular white patches on the under parts of the body. In very rare instances the tail is tipped with white. The fur, like that of most of the animals of the group to which it belongs, is an important article of commerce.

The principal characteristic of the mink in comparison with its congeners is its amphibious mode of life. It is to the water what the other weasels are to the land, or martens to the trees, being as essentially aquatic in its habits as the otter, beaver or musk-rat, and spending perhaps more of its time in the water than it does on land. It swims with most of the body submerged, and dives with perfect ease, remaining long without coming to the surface to breathe. It makes its nest in burrows in the banks of streams, breeding once a year about the month of April, and producing five or six young at a birth. Its food consists of frogs, fish, freshwater molluscs and crustaceans, as well as mice, rats, musk-rats, rabbits, and small birds. In common with the other animals of the genus, it has a very peculiar and disagreeable effluvium, which is more powerful, penetrating, and lasting than that of any animal of the country except the skunk. It also possesses the courage,

ferocity, and tenacity of life of its allies. When taken young, however, it can be readily tamed, and lately minks have been extensively bred in captivity in America both for the sake of their fur and for the purpose of using them in like manner as ferrets in England, to clear buildings of rats.

MINNEAPOLIS, by reason of her rapid growth, wonderful resources, and the unparalleled enterprise of her citizens is rightfully and universally conceded to be one of the phenomenal cities of the United States. The government census shows that in 1880 there were thirty-seven cities in the United States with larger populations than Minneapolis. The census made in 1900 shows wonderful progress, placing Minneapolis seventeenth in order of population among American cities. Minneapolis lies on both banks of the Mississippi river at the Falls of St. Anthony, is the county seat of Hennepin county, and the chief city of the State of Minnesota. Although the city is at the nominal head of navigation of the Mississippi river, only two lower-river steamboats have landed at the Minneapolis docks for eighteen years. The government steamer *Ada* landed May 2, 1890, and reported a depth of water sufficient to allow any of the steamboats landing at St. Paul to proceed to Minneapolis. Louis Hennepin in 1680 visited the Falls, and gave them their name, after one of his saints, Anthony of Padua. He made a few measurements and is supposed to have been the first white man to visit the site of the present city of Minneapolis. The name Minneapolis is a hybrid—"Minne" being Sioux for water and "polis" Greek for city.

At the beginning of the present century surveys were made by the United States Government, and after Fort Snelling was established at the mouth of the Minnesota river some of the officers of the fort came to the Falls of St. Anthony, entered land, and took up claims. The first real estate transfer was made in 1838, and during that year two buildings were erected. In 1845 the population of Minneapolis numbered fifty persons, and that year the first house with a shingle roof was built. In 1848 a saw-mill gave the initial impetus to Minneapolis' industries. In 1849 when the territory of Minnesota was organized, Minneapolis made a struggle for the capitol, but secured the State University instead. A newspaper was established in 1851. The original city was on the east bank of the river and was not Minneapolis, but St. Anthony. It was incorporated in 1860, and soon found an ambitious rival in the town on the west bank of the river. Minneapolis was incorporated under a town government in 1858, and as a city in 1867. In 1872 St. Anthony was incorporated in the Minneapolis municipality. Since that time the growth of Minneapolis has challenged the attention of the world. The city now covers an area of fifty-three square miles, and is situated on a level plateau with rolling prairie on all sides.

Population.—The population of Minneapolis in 1850 was 2,200; in 1860, 5,826; in 1870, 13,066; in 1880, government census, 46,887; in 1885, State census, 115,050. The United States census of 1900 announced the population as 202,718, thus showing the remarkable increase of 37,980 over the figures given in the census of 1890.

The Water Power.—The utilization of the great water power of the Falls of St. Anthony for manufacturing purposes, has been the foundation for the unparalleled prosperity of the city of Minneapolis. The water power is vested in two corporations, the Minneapolis Mill Company, and the St. Anthony Falls Water Power Company. There is within the city limits a fall of seventy feet, producing 35,000 horse power. Improve-

ments already undertaken, in the form of dams and lower tail races will add 12,000 horse power, which is to be utilized in the generation and transmission of electricity for manufacturing purposes.

The Mississippi here flows over a limestone bed resting upon a friable white sandstone; hence erosion is rapid, and the river banks show that the falls have receded from a position at the mouth of the Minnesota river. In 1851 ninety feet of the limestone gave way at once; and, as the rock bed extends but 1,200 feet above the present site of the falls, the destruction of the water-power was threatened. This has been averted by the construction of an apron or inclined plane of timber, with heavy cribwork at the bottom, and the building of a concrete wall in the bed of sandstone behind the falls and underneath the channel of the river. For this work the United States Government appropriated \$550,000, and the citizens of Minneapolis contributed \$334,500.

Minneapolis Manufactures.—Minneapolis is preëminently the "Flour City" of the world. Here are located the two largest flour mills on the globe; the Pillsbury "A" and the Washburn "A," their combined daily capacity being 11,350 barrels. The daily capacity of the twenty-four flour mills in the city is 37,850 barrels. The chief manufactures of Minneapolis for the year 1900 are:

CHIEF INDUSTRIES, 1900.	CAPITAL.	VALUE OF PRODUCTS.
All industries (2,368).....	\$57,708,204	\$110,943,043
Boots and shoes (5).....	410,340	1,008,007
Bread, other bakery products (62).....	801,960	1,287,254
Carpentering (176).....	946,938	5,412,038
Car and shop construction (4).....	1,333,949	1,550,513
Clothing, men's (152).....	631,349	1,676,519
Clothing, women's (205).....	270,454	1,049,012
Cooperage (14).....	322,615	1,314,635
Flouring and grist mills (12).....	14,322,061	49,673,568
Foundries and machine shops (62).....	1,642,754	2,570,601
Furniture factories (12).....	749,867	827,286
Ironwork (5).....	769,515	1,076,286
Liquors, malt (4).....	4,195,408	1,507,720
Lumber and timber mills (13).....	12,900,046	12,285,305
Lumber and planing mills (14).....	1,244,311	2,329,769
Masonry, brick and stone (53).....	390,150	2,267,773
Oil, linseed (3).....	1,128,092	2,017,214
Plumbing, and gas and steam fitting (66).....	348,168	1,441,553
Printing and publishing (152).....	2,206,150	2,573,794
Tobacco, cigars, etc. (42).....	206,203	532,491

Nearly all the money paid for grain in the interior is sent from Minneapolis by elevator companies and millers. During 1888 37,660,355 bushels of wheat were received and 11,707,640 bushels of wheat and 5,696,586 barrels of flour shipped from Minneapolis. The elevator capacity of Minneapolis, not including the storage capacity of the mills and mill elevators, is 15,415,000 bushels. The city is the greatest primary wheat market in the world. 41,734,095 bushels of wheat were received and 12,877,370 bushels shipped from Minneapolis in 1889, as compared with 15,973,285 bushels received and 10,916,604 bushels shipped from New York, which ranked next.

Ranking next to flour in importance is the lumber output of Minneapolis. Logs are floated down the Mississippi and its tributaries from the pineries of Northern Minnesota. The cut of lumber for ten years has been as follows: 1880, 195,452,200 feet; 1881, 230,403,800 feet; 1882, 312,239,800 feet; 1883, 278,716,480 feet; 1884, 300,724,373 feet; 1885, 313,998,166 feet; 1886, 267,196,519 feet; 1887, 220,822,974 feet; 1888, 337,663,301 feet; 1889, 275,855,648 feet.

The manufacture of furniture and agricultural imple-

ments is also a leading industry. The aggregate value of miscellaneous articles manufactured in Minneapolis for ten years has been as follows: 1880, \$10,333,000; 1881, \$14,872,000; 1882, \$15,727,000; 1883, \$24,002,000; 1884, \$25,627,000; 1885, \$27,327,000; 1886, \$35,320,000; 1887, \$40,000,000; 1888, \$46,470,000; 1889, \$48,384,000.

Jobbing Trade.—The great northern empire, lying between the great lakes and the Pacific Ocean, is naturally tributary to Minneapolis. There is no city so large as Minneapolis between Chicago and the Pacific coast. The country that relies upon Minneapolis for its wholesale supplies is rich in agriculture, mining, timber, and stock raising. The growth of the jobbing trade since 1880 is represented as follows: 1880, 42,745,620; 1881, 83,501,984; 1882, 97,376,000; 1883, 115,558,000; 1884, 127,381,462; 1885, 138,000,000; 1886, 155,341,000; 1887, 156,650,000; 1888, 187,696,000; 1889, 185,048,601.

Real Estate and Building.—In 1880, 3,161 transfers of realty were recorded, with an aggregate consideration of \$4,608,017; in 1883, 10,220 transfers, \$28,308,550; in 1886, 14,493 transfers, \$38,319,062; in 1889, 10,353 transfers, \$34,552,683. In 1901, 18 manufacturing, 21 warehouses, and 44 apartment buildings were erected; 763 frame, brick and stone dwellings, besides factories, etc., were erected at a cost of \$1,561,390. In 1888 building permits were taken out for the new court house and city hall and the Guaranty Loan building, aggregating \$3,250,000. The first named building is now in process of construction. The business blocks of Minneapolis are all substantial stone, brick, or iron and glass structures. During 1889 twenty-one permits were taken out for structures to cost between \$40,000 and \$100,000.

City Disbursements (1901).—During the year 1901 the city of Minneapolis made disbursements on the following accounts:

Current expense fund	\$ 906,366
Interest fund	328,267
Permanent improvement	211,520
Water works	269,933
City parks	198,123
Education	1,010,731
Library board	49,209
Charities, etc.	129,845
Fire department	334,750
Police department	217,750
Health department	49,990
Street Lighting	154,999
Engineer's department	30,199

Railroad Facilities.—The position of Minneapolis as a jobbing and grain center is due to her excellent railroad facilities. There are six all-rail competing lines to the seaboard *via* Chicago. There are six lines connecting with the head of Lake Superior. To the Pacific coast there are three competing lines north of the Union Pacific. The total mileage of roads centering in Minneapolis is as follows: Chicago and North-Western system, 7,025; Burlington system, 6,643; Chicago, Milwaukee and St. Paul, 5,655; Chicago, Rock Island and Pacific system, 4,902; Northern Pacific system, 3,465; Great Northern system, 3,249; Chicago, St. Paul and Kansas City, 858; Minneapolis, St. Paul and Ste. Marie, 787; Wisconsin Central, 768; St. Paul and Duluth, 231; total, 33,583.

City Government and Finances.—The city government consists of a mayor, police commission, and a common council of thirty-nine members. There are thirteen city wards. The councilmen are elected for two and four year terms at elections held every two years

The total bonded debt of the city on January 1, 1902, was \$8,250,500. The limit of bonded indebtedness is fixed at 5 per cent. on the taxable valuation of all property. The city is restricted from incurring any floating indebtedness. The average rate of interest upon the entire bonded debt of the city is 4.73 per cent. The value of all property owned by the city of Minneapolis, January 1, 1890, was as follows: City property, \$8,061,161; board of education, \$2,099,300; parks, \$3,918,400; public library building, \$320,654; court house and city hall (new and partially completed), \$761,911. Total \$15,161,426. The city's receipts from all sources for the year 1901 were \$1,023,947; from disbursements, \$945,515. The city possesses sixty-four miles of sewers, twenty-five miles of paved street, and 142 miles of water mains. There are three pumping stations with a combined pumping capacity of 73,000,000 gallons of water daily.

Assessed Valuation and Tax Levy.—The assessed valuation of Minneapolis as equalized by the State board of equalization in 1901 was: Real estate, \$80,129,845; personal, \$22,082,661; total \$102,212,506. The assessed value of real estate and personal property, and tax levy for each year, from 1875 to 1901 is as follows:

YEARS.	Total Real Estate and Personal.	Rate, Mills.
1875.....	\$21,834,079	20.65
1876.....	20,779,416	22.45
1877.....	20,878,502	23.02
1878.....	20,866,558	22.02
1879.....	23,415,733	13.90
1880.....	28,013,315	16.10
1881.....	31,188,486	19.10
1882.....	49,702,044	18.20
1883.....	53,901,815	20.80
1884.....	74,310,711	16.00
1885.....	77,468,267	20.00
1886.....	99,560,468	17.10
1887.....	107,872,000	20.06
1900.....	99,492,054	27.40
1901.....	102,212,506	29.86

Postoffice Gross Receipts.—The Minneapolis postoffice during 1889 employed seventy-four letter-carriers, who handled 74,078,778 pieces of mail. The gross receipts of the Minneapolis postoffice each fifth year since the establishment of the office in 1854 were as follows:

1859.....	\$ 2,234.05
1864.....	4,467.33
1869.....	18,882.64
1874.....	40,670.90
1879.....	63,880.45
1884.....	178,218.97
1889.....	309,400.00
1900.....	740,664.00

Public Schools.—The public schools of Minneapolis number sixty, with sittings for 17,850 pupils. Only two of the school buildings are rented. The teachers employed are 466, and the whole number of pupils enrolled during 1888-90, 21,196. In the evening schools 2,545 pupils are enrolled, and in the High schools 1,166. At the State University in East Minneapolis 1,003 students were in attendance April 4, 1890.

Banks.—There were on May 1, 1890, twenty-two banks with an aggregate capital of \$8,870,000. Besides the banks there are four loan and trust companies with an aggregate capital of \$2,500,000. The bank clearances of the city in 1883 were \$87,508,000; in 1885, \$125,477,478; in 1887, \$194,777,533; in 1889, \$240,659,504, an increase of 11 per cent. over the year 1888.

Churches, Library, and Hotels.—Minneapolis has 155

church and mission societies, the value of whose property actually used for church purposes aggregates \$3,668,000. The amount expended upon improvements to this property in 1889 was \$210,460. The membership of Minneapolis churches is 31,626. The Baptists and Methodists have twenty-three societies each, the Congregationalists nineteen. The Catholic church has a membership of 4,500. A public library has been erected at a cost of \$318,000. The library numbers 40,000 volumes, and has an annual income of \$75,000. There are nine leading hotels.

Health, Police, and Fire Departments.—The mortality rate was eleven per thousand during the year 1901. The police department consists of 225 men. The aggregate expense of the department for the year 1901 was \$217,750; 5,292 arrests were made during the year, of which 2,085 were for drunkenness. The French system of identification of criminals is used. Saloons are restricted within certain defined limits within the business center.

The fire department of Minneapolis numbers 306 officers and men, occupying eighteen engine houses. The apparatus consists of sixteen steamers, fifteen hose carts, six chemicals, six hook and ladder trucks, 169 horses, supply, fuel, exercising wagons, etc. The number of fire hydrants in the city is 3,307. The pumps located four miles above the center of the city furnish 15,000,000 gallons of Mississippi river water for fire department and domestic use. There are 100 fire alarm boxes. The expense of the department for 1901 was \$334,750. The fire loss for 1901 was \$471,488; insurance, \$1,702,304. One thousand one hundred and ninety-five alarms were responded to during the year.

Parks.—The parks of Minneapolis comprise 1,155 acres and are valued at \$3,918,400. In connection with these are nineteen and a half miles of boulevards and park ways. This property was acquired mainly by direct purchase at about one-fifth of its present value. It cost to maintain this system in 1901 \$38,000. Lake Harriet Park covers 415 acres, and the park surrounding the Falls of Minnehaha, made famous by the poet Longfellow, 173 acres.

Street Railways.—There are eighty-five miles of street railroad tracks in Minneapolis, owned and operated by the Minneapolis Street Railway Company. Electricity was substituted for horse power on the Fourth avenue line in December, 1889, and on May 10, 1890, a force of 2,000 men was employed in changing all other lines in the city so that they can be operated by electric power; 430 cars are in use, and 730 men are regularly employed. The fare on the line to St. Paul, now completed, is ten cents. Fares on all Minneapolis lines are five cents, and transfer checks are issued from one line to another, and from the Minneapolis to the St. Paul systems.

The city of Minneapolis and the sister city St. Paul together form the marvel of the Northwest—the far-famed "Twin Cities." They lie at a distance of ten miles from each other, and are, in interest and importance, really on a common basis, although there exists between the two places a spirited friendly rivalry. It is not too much to predict that, if the rate of growth heretofore experienced by each of these rapidly increasing cities is maintained, it will not be the work of many years to cover the entire space between the two towns with buildings and population, and make of the two one united city. They are now to all intents and purposes one city—the means of transportation between them being as available as are the street railways running from one section to another in each separate city. Many of the residents of one city are employed in the other.

MINNESOTA, one of the northwestern States of the American Union, extending from Iowa to the British possessions, and from Wisconsin and Lake Superior on the east to North and South Dakota on the west. Its area, including half of the lakes, straits, and rivers along its boundaries, except Rainy Lake and Lake of the Woods, amounts to 83,365 square miles.

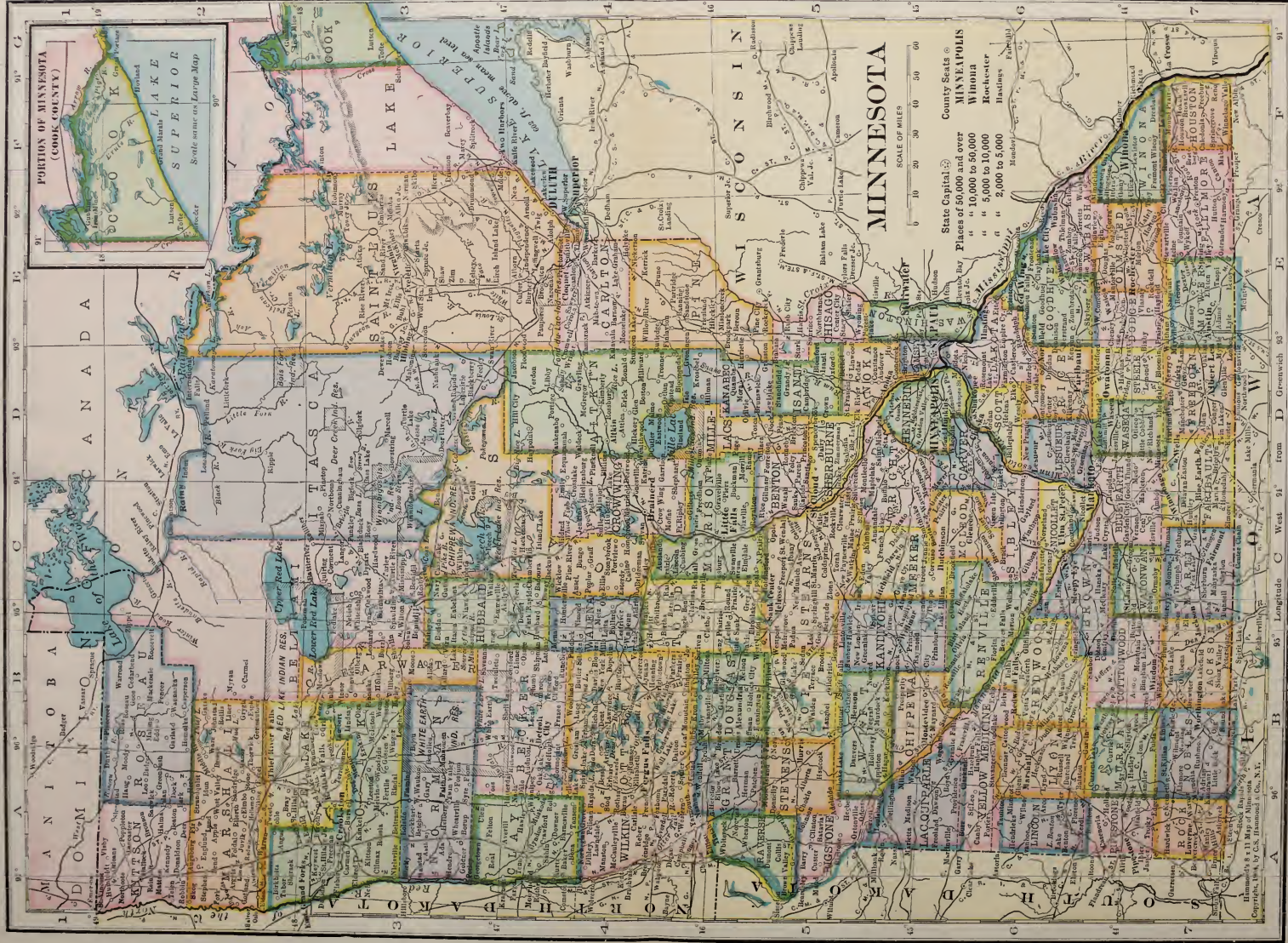
The surface of Minnesota is diversified by few elevations of any great height. In general it is an undulating plain, breaking in some sections into rolling prairie, and traversed by belts of timber. It has an average elevation above sea-level of about 1,000 feet. The watershed of the north (which determines the course of the three great continental river systems) and that of the west are not ridges or hills, but elevations whose inclination is almost insensible. The southern and central portions of the State are chiefly rolling prairie, the upper part of which is crossed from northwest to southeast by the forest belt known as the Big Woods—a stretch of deciduous forest trees with an area of about 5,000 square miles. North of the forty-seventh parallel, the great Minnesota pine belt reaches from Lake Superior to the confines of the Red River valley, including the region of the headwaters of the Mississippi and its upper tributaries, as well as those of the Superior streams. North of the pine region there is but a stunted growth of tamarack and dwarf pine. In the northeast are found the rugged elevations of the granite uplift of the shores of Lake Superior, rising to a considerable height; while in the northwest the surface slopes away to the level prairie reaches of the Red River valley. The surface elevation of the State varies from 800 to 2,000 feet above sea-level. A short line of hills in the northeast reaches the latter altitude, while only the valleys of the Red River, the Mississippi, and the Minnesota fall below the former.

The great central zone, from Lake Superior to the southwestern extremity of the State, is occupied by granitic and metamorphic rocks, succeeded, in the southeast, by narrower bands of later formation. Within the great Azoic area lies the central watershed of the continent, from which the St. Lawrence system sends its waters toward the Atlantic, the Mississippi toward the Gulf of Mexico, and the Red River of the North to Hudson's Bay. These primordial rocks carry back the geologic history of Minnesota to pre-Silurian times. They form in the northeast, in the neighborhood of Lake Superior, an extremely rough and hilly country, but as they reach the central and southwestern portions of the State they for the most part disappear beneath the surface drift. This central belt is succeeded, on the south and east, by a stretch of sandstone, partially the true red Potsdam and partially a similar but lighter-colored stratum, which some have proposed to designate the St. Croix sandstone. Isolated beds of sandstone are found in various parts of the State. The northwestern corner, stretching east from the Red River valley, is believed to be Cretaceous; but the great depth of drift and alluvium, disturbed by no large rivers, prevents a positive conclusion. The Lower Magnesian limestone underlies the extreme southeastern portion of the State, and extends along the west side of the Mississippi to a point a little below St. Paul; thence it takes a course almost semicircular, and finally passes out of the State at the southwestern boundary. The Trenton limestone occupies a large field in the south and southeast; it comes to the surface in long irregular bands, and an island of it underlies the cities of Minneapolis and St. Paul with the adjacent districts. The Galena limestone, the Masquoketa shales, the Niagara limestone, and the rocks of the Devonian age in turn prevail in the other counties of the south and east;

while the existence of the St. Peter sandstone would scarcely be known but for its outcropping along the bluffs of the Mississippi, and at the famous waterfall of Minnehaha. From these various formations numerous kinds of stone valuable for building purposes are obtained. The gray granite of St. Cloud is extremely hard and enduring. The Lower Magnesian furnishes two especially handsome building stones—the pink limestone known as Kasota stone, and the cream-colored stone of Red Wing, both easily worked, and hardening by exposure to atmospheric changes. Naturally, from its location underneath the principal cities of the State, the Trenton limestone is the most widely used. Sand suitable for glass-making, and argillaceous deposits abound. The clays which make up so large a portion of the surface drift of the State are almost wholly of glacial origin. Overlying the deposits of sand, gravel, boulders, and clay is, in most portions of the State, a sandy loam, very finely divided, rich in organic matter, deep brown or black in color, and of the greatest fertility. It is this soil which has given to the State its reputation for productiveness. Its depth varies from two to five feet in various parts of the State, and it is excellent in quality, rich as well in organic matter as in those mineral salts which give rapidity to the growth of plants, while it has that durability which enables it to sustain a long succession of crops.

The State holds a unique place with reference to the great water systems of the continent. The Mississippi takes its rise in Lake Itasca, north of the center of the State. Before it leaves the State limits it becomes a great river, half a mile wide, and from five to twenty feet deep. It drains with its tributaries all the southern and central portions and a large area of the northern part of the State. It is navigable as far as St. Paul, and at Minneapolis the falls of St. Anthony afford unrivaled facilities for manufacturing. Of the many affluents of the Mississippi the most important is the Minnesota, which, after a course of about 440 miles, flows into the main stream at Fort Snelling, three miles above St. Paul. The source of the Minnesota is but one mile from Lake Traverse, the origin of the Red River of the North, and it is navigable during the high-water season for about 238 miles. Its principal tributaries are the Blue Earth, Chippewa, Redwood, Lac qui Parle, and Pomme de Terre. The Red river system drains the northwestern part of the State, and its waters finally pass into Hudson's Bay, as also do those from the country drained by streams flowing to the Rainy Lake river and the lakes along the northern boundary line. East of this lies the region tributary to Lake Superior and the St. Lawrence system. This comprises an area within the State estimated at 9,000 square miles. Its principal river is the St. Louis. There are altogether about 2,796 miles of navigable water in Minnesota.

The number of lakes is estimated at seven thousand. They are of all sizes, and are found chiefly in the northern two-thirds of the State. They have been classified geologically into glacial or drift lakes fluvial or river lakes, occupying basins on river courses, and lakes having rock basins either scooped out by the action of glaciers or formed by the relative position of different geological formations. By far the greater number give evidence of glacial action in their origin. They abound over the region most deeply covered by the surface drift, and are especially prevalent in moraine districts, forming the southern fringe of the lacustrine area of North America. With the melting of the ice-sheet which once overspread Minnesota its innumerable lakes came into existence; and the gentle acclivity of its slopes, precluding rapid erosive action, has tended



to give permanence to the depressions constituting their basins. The census returns give 4,160 square miles of water service within the State. Most of the lakes are exceedingly picturesque in their surroundings. Forests skirt their shores, which are seldom marshy; and their waters, abounding in various kinds of fish, are clear and cool. Besides the sanitary advantages afforded by the lakes, as supplying places for recreation and delightful summer resorts, they effect the climate to some extent, tempering the extremes commonly experienced in northern latitudes. The fact that many of the lakes are gradually drying up must be explained by agricultural operations. The largest lakes, exclusive of Superior, lying wholly or in part in Minnesota are as follows: Lake of the Woods, 612 square miles; Red, 342; Mille Lacs, 198; Leech, 194; Rainy, 146; Winnibigoshish, 78, and Vermilion, 63.

The flora and fauna present no marked differences from those of other states in the same latitude. In a partial list of the birds of Minnesota, two hundred and eight-one species are enumerated. Of winter birds fifty-two species have been classified, twenty-three of them being permanent residents.

The State lies so far north as to have a low mean annual temperature, and so far inland as to have the characteristic continental climate. Its elevation above sea-level gives an agreeable rarefaction to the atmosphere, and makes the prevalence of fogs and damp weather unknown. Between June and January there is an annual variation from the summer heat of southern Ohio to the winter cold of Montreal. The winter, usually commencing in November, and continuing till near the end of March, is not a period of intense continued cold, but is subject to considerable variations. As a rule, the comparative dryness of the atmosphere neutralizes the severest effect of excessive cold. The snowfall is extremely light during most of the winter, but as spring approaches precipitation becomes greater, and there are frequently heavy snowfalls in February and March. The change from winter to summer is rapid, vegetation sometimes seeming to leap into full and active growth within the space of a few weeks. The summer months bring days of intense heat, but, with comparatively rare exceptions, the nights are deliciously cool. Hot days and cool nights make the ideal weather for a good wheat crop; and the forcing heats of summer produce in luxuriant growth the vegetable life which belongs to the Middle States. The Smithsonian chart assigns to Minnesota an average temperature for the hottest week in summer of from 85° to 90°, and for the coldest week in winter from 10° to 20° below zero. The mean annual average, for all below 47° of latitude, it gives as 40°. Observations at St. Paul, extending over a period of more than thirty-five years, show the following mean temperatures: spring, 45.6°; summer, 70.6°; autumn, 40.9°; winter, 16.1°; average, 44.6°. The average annual rainfall is about 25.5 inches. While this is not large, it is so distributed as best to subserve the purposes of vegetable growth. No moisture is lost in superfluous spring and autumn rains, or in the cold and non-producing part of the year, the precipitation, which in winter is less than two inches, increasing to about twelve for the summer. To the season of vegetable growth belong 70 per cent. of the yearly measures of heat, 76 per cent. of the rainfall, and 76 per cent. of the atmospheric humidity. The prevailing winds are from the south or south-east. It is evident that the causes which mitigate the actual severity of the climate as felt, which produce so large a number of clear days, and which forbid the continued presence of a large amount of moisture in the atmosphere, are those which render a climate health-

ful in the highest degree. Minnesota has been for many years a favorite resort for invalids. The curative properties of its climate are especially marked in the case of pulmonary complaints.

The leading industry of the State is agriculture. The character of the surface soil varies in different parts of the State with the character of the underlying strata. The fertile land comprises about three-fourths of the entire area of the State. The drift soil proper of the south and center, including the Minnesota valley and the greater part of that of the Mississippi, contains silica and calcareous matter, and is interspersed with alluvial river bottoms. The limestone soil, in which there is a large calcareous element, lies chiefly on the western slope of the Mississippi. The Red River valley consists of an argillaceous mold, rich in organic deposits. Around Lake Superior, wherever arable land is to be found, it is marked by a rich trap soil. North of the central fertile area, and in the neighborhood of the sources of the Mississippi, is much swampy land, susceptible of easy drainage, with a large tract of sand and other drift detritus, unfavorable to production. Maize and potatoes flourish, and the uplands, which support hardwood ridges, are suited to general agriculture. To the extreme north the surface, while indicating mineral wealth, is utterly unfit, except in occasional isolated areas, for purposes of tillage.

Wheat has hitherto been the staple product of the State. Soil and climate are such as to insure a large average yield, while the superior quality of the grain has given it a wide reputation. The other cereals are also cultivated with success. The tendency to diversify agriculture, especially in the southern part of the State, has been stimulated by several partial failures of the wheat crop, the locust invasions, and the competition of the farther northwest. The area of the state includes 26,248,498 acres improved, 7,805,913 acres not improved, and 2,700,000 acres of lake surface.

The official returns for 1899 show the principal field products as follows:

	Acreage.	Total Yield Bushels.	Value.
Wheat.....	6,560,707	95,278,660	\$ 50,601,948
Oats.....	2,201,325	74,054,150	15,829,804
Corn.....	1,441,580	47,250,920	11,337,105
Barley.....	877,845	24,314,240	7,220,739
Rye.....	118,869	1,866,150	783,852
Buckwheat.....	6,700	82,687	43,741
Potatoes.....	146,659	14,643,327	3,408,997
Beans.....	3,290	30,317	49,685
Sorghum Cane (tons).....	2,283	1,232	2,818
Sugar Beets (tons).....	2,114	15,959	59,826
Hay and Forage (tons).....	3,157,690	411,667	14,585,281
Flaxseed (bushels).....	566,801	5,895,479	5,893,556

Other agricultural products were wild hay, tons, 2,842,234; flaxseed, bushels, 5,895,479; clover seed, bushels, 8,034; apples, bushels, 120,143; plums and prunes, bushels, 21,820; tobacco, pounds, 127,730.

It is estimated that the aggregate of lands yet undisposed of, three-fourths of which may be profitably cultivated, is nearly 20,000,000 acres, exclusive of the lands belonging to the State. White Earth Indian reservation has thirty-six townships of prairie and timber land; and Red Lake reservation contains 3,200,000 acres.

Minnesota is still rich in timber, white pine being the most valuable forest product. There is also a considerable quantity of hardwood yet available, although great inroads have been made upon the natural growth and there has been much wastefulness in the operation of marketing the production.

Every encouragement is afforded, both by the railway corporations and by the State, to tree-planting on the prairies. A quarter section is given to anyone who will plant and keep in good condition forty acres of timber for eight years. In one year there were planted 25,331 acres of trees, exclusive of those bordering highways and the windbreaks along the railroad lines.

The manufactures of Minnesota in 1900 yielded \$262,655,881. The abundant water-power of the State, its proximity to the coal-fields of Iowa, its superior transportation facilities, and the large demand for manufactured commodities are, however, rapidly developing this branch of industry. The most important industries are the manufacture of flour and that of lumber. The former naturally established itself in a State of immense wheat yield and abundant water-power. It received its greatest stimulus from the invention and adoption of the middlings purifying process, which produces the highest grade of flour, and to which the hard spring wheat of Minnesota is especially adapted. Among other manufacturing industries actively prosecuted are the making of brick, pottery, stoneware, and agricultural implements, and also meat-packing.

The geographical position of Minnesota gives it extensive commercial interests. Two continental waterways terminate within the State. The Mississippi affords continuous navigation to European ports during eight months of the year. From Duluth numerous lines of vessels traverse the chain of great lakes, and transport the products of the west to the eastern seaboard. Three great transcontinental railway lines are connected more or less directly with the railroad system of the State. Twelve lines of railway from every part of Minnesota converge at the contiguous cities of St. Paul and Minneapolis, and three great trunk lines from these centers to Chicago secure the advantages of a lively competition.

The number of miles of railroad in operation June 30, 1900, was 7,023. The capital stock, bonds, and debt of all the railroads in the State was \$206,418,049, and their net income was \$10,420,516. During the year 10,443,230 passengers were carried, and 11,987,905 tons of freight were moved.

On June 30, 1901, there were 188 banks operating under State charters, their total resources being \$38,685,212. The eighty-six national banks had a capital of \$12,749,600 and deposits of \$54,427,979. Their reserve was \$23,080,644. The seven State savings banks had resources amounting to \$1,242,891, and the six loan and trust companies represented \$4,222,299.

The common school system is supported by land grants, a local tax, and a State tax. The superintendent of instruction is appointed by the governor. County superintendents are chosen by popular vote. Common school districts have boards of three trustees each. Six directors are appointed for independent districts. The permanent fund in 1900 was \$6,776,767. The State university, located at Minneapolis, is governed by a board of regents, consisting of the governor of the State, the superintendent of public instruction, the president of the university, and six others; both sexes are admitted, and tuition is free. Forty-two academies and six colleges are sustained by denominational or private enterprise.

The enrollment in the public schools in 1899 was 384,063, and the average daily attendance was 237,145. The male teachers numbered 2,814, and the females 8,733. The expenditures for school purposes were \$5,172,112. There are four normal schools supported by the State, and schools for the deaf, blind, and feeble-minded.

The departments of government are, as in all the States, the legislative, the executive, and the judicial. The State contains eighty-three counties. From these are elected by districts forty-seven senators and one hundred and three members of the House of Representatives. The State officers are a governor, lieutenant-governor, secretary of state, treasurer, auditor, and attorney-general, all elected by the people. The term of office is two years. The governor has power to veto separate items of a money bill. The judiciary is elective, and the term of office seven years. The State requirements for citizenship are residence in the United States one year, in the State four months, and in the election district ten days preceding an election. Women are allowed to vote for school officers and upon questions relating to the management of schools, and are also eligible to such offices. No county can contain more than 400 square miles. The legislature meets biennially. Extra sessions may be called, but no session can exceed sixty days in length. Under the last apportionment the State is entitled to five representatives in the national Congress.

The report of the State treasurer for the fiscal year ending July 31, 1900, showed that \$9,015,168 was received. The expenditures were \$6,845,830, leaving a balance of \$2,169,337 in the treasury. The bonded debt consists of \$1,279,000 railroad adjustment bonds, and \$400,000 State revenue bonds. The general school fund receipts for the year were \$1,258,446, the disbursements \$1,306,352, overdraft for the year July 31, 1900, \$47,906, minus the large balance brought forward from the previous year.

The population of the State was 6,077 at the census of 1850, 172,023 in 1860, 439,706 in 1870, and 780,773 (419,149 males, and 361,624 females) in 1880. The State census of 1900 showed that of the 1,751,394 inhabitants then recorded, 1,246,076 were native born. There were 45,473 Canadians, 31,801 Irish, 112,926 Germans, 80,735 Swedes, 92,428 Norwegians, 11,785 Danes. The population in 1900 was 1,751,394. The most important cities are St. Paul, the capital, Minneapolis, Winona, and Stillwater.

Missionary efforts and the trading spirit first induced white men to venture as far into the unexplored northwest as the boundaries of what is now the State of Minnesota. The earliest accounts of its natural features and native tribes appear in the Jesuit writings. The "Relations" of 1670-71 allude to the Sioux or Dakotas. In 1678 a company was formed for trading with this tribe. Du Luth was leader of this expedition, and later on went from Lake Superior to the Mississippi by canoe. But the first published account is that of Louis Hennepin, a Recollect monk, who, in 1680, visited the falls of St. Anthony, and gave them their name, from that of his patron saint. For a century the only visitants of the wild region were a few missionaries, and a number of fur traders who found the profit of the journey to more than counter-balance its perils and hardships. To the latter class belong Perrot, who reached the Mississippi by way of the Fox and Wisconsin in 1684, and founded at Lake Pepin the first trading post in the State, and Le Sueur, a Canadian, who ascended the great river from its mouth, and established another post above Lake Pepin. Capt. John Carver, the explorer of the country of the upper Mississippi, visited the falls of St. Anthony in 1776, being the first British traveler who reached the spot. On March 20, 1804, Upper Louisiana was organized, consisting of Arkansas, Missouri, Iowa, and a large portion of Minnesota. From this time onward the progress of exploration was rapid, and settlement followed in its train. The first really extensive exploration of any large part of what

is now Minnesota was made between 1817 and 1823 by Maj. S. H. Long, of the United States engineer corps, in command of a government expedition. About the same time the Red River received its first visitant. Thomas Douglas, earl of Selkirk, an Englishman of eccentric character, went, in 1817, to what is now Winnipeg, by way of York river. Having been struck with the agricultural possibilities of the region about the Red River of the North, he induced a colony of Swiss farmers to settle there. These were disappointed in the country, and unused to the severity of the climate, so that they finally removed to the vicinity of St. Paul and contributed to the earliest development of the agricultural industry of the State. In 1821 Colonel Snelling built, at the junction of the Minnesota and Mississippi rivers, a stronghold which he named Fort St. Anthony. The name was changed to Fort Snelling in his honor, in 1824, and the fort is still an important post as a base of supplies for the newer northwest. The first steamboat made its appearance at the head of navigation in 1823. The settlement of St. Paul, one of the oldest towns as well as the capital, is commonly dated from 1846, at which time there were a few shanties on its site. Population now began to arrive in constantly increasing numbers, and on March 3, 1849, a bill passed Congress for organizing the territory. It was proposed at one time to name it Itasca, but the name Minnesota, meaning, "sky-tinted water," and originally applied to the river bearing that title, was finally retained. The western boundary of the territory was fixed at the Missouri river. The population was but 4,057, the largest town had but a few hundred inhabitants, and a large part of the soil of the State still belonged to the Indians. But progress now began in earnest. A constitution was adopted in 1857, and on May 11, 1858, Minnesota was admitted as a State, with a population, according to the last territorial census, of 150,037.

One of the first acts of the new State was the issue of railroad bonds. Soon after came the civil war. Within two months of Lincoln's first call for troops the first Minnesota regiment, over 1,000 strong, was mustered into service. By August of 1862, ten regiments had been called for and furnished. In all the State supplied to the armies of the Union 25,052 men, or about one-seventh of its entire population at the outbreak of the war.

In the meantime there occurred in 1862, the horrible outbreak known as the Sioux massacre. Settlements were cut off, isolated settlers murdered, and even a strong post like Fort Ridgely was attacked. The outbreak spread over a large portion of the State; several severe engagements were fought; and it was not until the State had a thoroughly equipped military force ready for the campaign that the Indians began to flee or to give themselves up. By this time over 700 persons had been murdered, 200, chiefly women, taken captive; eighteen counties were ravaged, and 30,000 people were homeless. The property loss was not less than \$3,000,000.

MINNOW (*Leuciscus phoxinus* or *Phoxinus phoxinus*) is the smallest British Cyprinoid, readily distinguished by its very small scales. It is abundant in rivers, brooks, and lakes, always swimming in schools, and shifting its ground in search of food, which consists of every kind of vegetable and animal substance. It ranges from southern Europe to Scandinavia, and from Ireland into northeastern Asia; in the Alps it attains to a higher altitude than any other Cyprinoid, viz., to nearly 8,000 feet. Its usual size varies between two and three inches; but in suitable localities, especially in Germany, it is known to reach a length of from four to five inches.

MINO DI GIOVANNI, called **DA FIESOLE**, was

born at Poppi in the Casentino in 1431. He had property at Fiesole, whence his usual name. Mino was a friend and fellow-worker both with D. da Settignano and Matteo Civitate, all three being about the same age. There is considerable similarity in their works, showing mutual influence. Mino's sculpture is remarkable for its gem-like finish and extreme delicacy of detail, as well as for its spirituality and strong devotional feeling. Some of Mino's portrait busts and delicate profile bas-reliefs are preserved in the Bargello at Florence; they are full of life and expression, though without the extreme realism of Verrocchio and other sculptors of his time. He died in 1486.

MINOR. See **INFANT**.

MINORCA. See **BALEARIC ISLANDS**.

MINORITES. See **FRANCISCANS**.

MINOS, a legendary king of Crete, in whom both historical and religious elements are united. The historical element lies in the fact that an early civilization and maritime power had its seat in Crete. The Phœnician intercourse played a great part in developing this island state, and Minos is sometimes called a Phœnician. It is highly probable that the name Minos is the Greek form of the original *Manwa*, i.e., "endowed with thinking," which is seen in the Hindu Manu and the Germanic Mann. As in all other heroic forms of the god of the dead, there is both a terrible and a wise and beneficent side in the character of Minos. Cretan legends described him as the wild huntsman of the forests and mountains, the lover of the nymphs, though his love means death to them. His death is localized in the far west, in the land of sunset; his grave was shown at Camicus near Agrigentum, attached to a temple of Aphrodite. The Minotaur is one of those monstrous forms which were suggested to the Greek fancy by the quaint animals common in Oriental art. It was shut up in the **LABYRINTH** (*γ.ν.*), which was constructed by the skilled artist Dædalus. Now a son of Minos named Androgeus had been killed by the Athenians, and Minos as a punishment required that seven Athenian youths and seven maidens should be sent every ninth year and given up to the Minotaur to be devoured. When this sacrifice took place for the third time Theseus came as one of the hostages, and slew the Minotaur with the help of Ariadne.

MINOTAUR. See **MINOS**, ante.

MINSK, a western government of Russia, is bounded by Vilna, Vitebsk, and Moghileff on the north and east, and by Tchernigoff, Kieff, Volhynia, and Grodno on the south and west, and has an area of 35,175 square miles. The surface is undulating and hilly in the northwest, where a narrow plateau and a range of hills of the Tertiary formation runs to the northeast, separating the basin of the Niemen, which flows into the Baltic, from that of the Dnieper, which sends its waters into the Black Sea. The population of the province was in 1898 estimated at 2,156,123, mostly White Russians (67 per cent.); there are also Poles (about 11 per cent.), especially in the western districts, Jews (more than 10 per cent.), Little Russians (5 per cent.), and Russians (2 per cent.). About 70,000 are considered Lithuanians; there are also 4,000 Tartars, whose presence can be traced to the raids of their ancestors on Lithuania in the thirteenth century, and about 2,000 German agriculturists who settled in the last century.

MINSK, the capital of the above province, is situated on the Svislochi, a tributary of the Berezina, 465 miles by rail west from Moscow. In 1898 it had 91,494 inhabitants, of whom one-third were Jews of the poorest class; the others were White Russians, Poles, and Tartars. The manufactures are few and insignificant.

MINSTREL. The "minstrels," according to Bishop

Percy, "were an order of men in the Middle Ages who united the arts of poetry and music, and sang to the harp verses of their own composing, who appear to have accompanied their songs with mimicry and action, and to have practiced such various means of diverting as were much admired in those rude times, and supplied the want of more refined entertainments." This conception of the "minstrel" has been generally accepted in England ever since Percy published his *Reliques of Ancient Poetry*, which he gave to the world as the products of the genius of these anonymous popular poets and harpers. The name has been fixed in the language by the usage of romantic poets and novelists; Scott's "last minstrel" and Moore's "minstrel boy" were minstrels in Percy's sense of the word. All the allusions to minstrels in literature from Langland's time to Spenser's point to them as strolling musicians. Some of them may have sung to the harp verses of their own composing, and some of them may have composed some of the ballads that now charm us with their fresh and simple art; but the profession of the "minstrel," properly so-called, was much less romantic than Bishop Percy painted it.

MINT. The mint is the place where the coinage of a country is manufactured, and whence it is issued by sovereign authority, under special conditions and regulations. The privilege of coining has in all ages and countries belonged to the sovereign. At a very early stage of civilization it was found necessary to have some definite medium of exchange, in order to avoid the great inconvenience arising from the system of payment in kind, which was the primitive and natural method. It was not long before metal came to be used as such a medium, probably from its durability and portability, and in the case of gold and silver on account of their intrinsic value. The less liable the value of a metal is to change the better is it suited for a standard of value.

The metals chiefly used were silver and brass, which were at first simply exchanged by weight for commodities of all kinds. As commercial transactions became more numerous and more complicated, this system of payment grew troublesome, and it was found convenient to divide the mass of metal into small parts, which soon took the form of rough coins. But the principle of payment by weight was retained through many centuries, and is perpetuated, though in name only, in the word "pound."

The actual operations of coining in early times were few in number and simple in character. The metals forming the alloy were melted together in the proportion necessary to bring them to the required standard, and the alloy thus obtained was cast into bars, which were reduced by hammering to the requisite thickness. They were then cut with shears into pieces more or less regular in size and form, roughly annealed, and finally impressed with the prescribed device by a blow with a hammer.

The last-named appears to have been the only part of the process which was performed with any great amount of care. It was long before the system of coining by hand was superseded by the coining press, or mill, which, even after its first introduction, was only very slowly adopted. Several attempts were made to introduce machinery for coining before it was brought into active use, the objection to it being its great expense. The mill and screw were finally introduced into the mint under Charles II., when many improvements were also made in the preliminary operations. Steam-power was first applied in 1810, when the vacuum screw-press was introduced. In 1839 Uhlhorn invented the lever-press, which still remains in use.

The subject of the design on coins, besides being interesting from both an artistic and an historical point of view, becomes very important when it is remembered that it is the impression of the coin with the authorized device which makes it legally current. The artistic merits of the design of the early Greek coins are well known, and prove that the dies from which the coins were struck must have been engraved with much skill and care. It has been ascertained that the impressions on the reverse of very early Greek coins were produced by the rough surface of the anvil or the nail head on which they were placed, while the obverse was struck with the die. A little later the device on the reverse of the coins was obtained by placing the blank piece on small points of metal arranged in geometrical form which caused corresponding indentations on the coins when struck with the hammer. The beauty and accuracy of design on coins gradually increased as art and manual skill developed, and probably culminated at the period of the Renaissance.

Although it has been the custom since the time of the Saxons to stamp coins with the head of the reigning monarch, it does not appear that any attempt at actual portraiture was made in England until the reign of Henry VII. Since then much care seems to have been taken to stamp the coins with a true likeness of the monarch.

In the United States there are five mints—at Philadelphia (since 1793), New Orleans (1835), San Francisco (1854), Carson City and Denver—all under the charge of the Bureau of the Mint of the U. S. Treasury Department, and presided over by the Director of the Mint. Only the first three are in active operation, the other two are really assay offices; and at Philadelphia alone all the authorized coins are struck. The United States coins and their weights are as follows, those marked with an asterisk having been discontinued:

Denomination.	Weight in Grains.	Denomination.	Weight in Grains.
GOLD.		20 cent	77.16
Double eagle	516	Dime	38.53
Eagle	258	Half-dime	19.2
Half-eagle	129	3 cent	11.52
Quarter-eagle	64.5	MINOR COINS.	
3 dollar piece	77.4	5 cent (nickel)	77.16
Dollar	25.8	3 cent (nickel)	80
SILVER.		2 cent (bronze)	96
Dollar	412.5	Cent (copper)	168
Trade-dollar	420*	Cent (nickel)	72
Half-dollar	192.9	Cent (bronze)	48
Quarter-dollar	96.45	Half-cent (copper)	84

The total amount of gold coinage minted from 1793 to the end of 1901 was \$2,049,854,219; silver, \$812,392,172; minor coin, \$27,463,608.

MINT, botanically *Mentha*, a genus of labiate plants, comprising about twenty species of perennial herbs, widely distributed throughout the temperate and subtropical portions of the globe. All the species are furnished with square stems, opposite, aromatic leaves, and creeping roots. The flowers are arranged in axillary cymes, which either form separate whorls or are crowded together into a terminal spike. The corolla is usually small, and of a pale purple or pinkish color; it has four nearly equal lobes, and incloses two long and two short stamens. Great difficulty is experienced by botanists in discriminating the species of this genus by reason of the occurrence of a large number of intermediate forms, nearly three hundred of which have been named and described. Many of these varieties are permanent in consequence of being propagated by stolons.

All the plants of the genus *Mentha* abound in a volatile oil, which is contained in small receptacles

having the appearance of resinous dots in the leaves and stems. The odor of the oil is similar in several species, but is not distinctive, the same odor occurring in varieties of distinct species, while plants which cannot be distinguished by any botanical character possess the same odor.

MINTO, SIR GILBERT ELLIOT, FIRST EARL OF, was born at Edinburgh, April 23, 1751. After spending the winters of 1766 and 1767 at Edinburgh University, Elliot entered Oxford. On quitting the university he became a member of Lincoln's Inn, and was in 1774 called to the bar. He entered parliament in 1776, the year of his father's death. Although he gave a general support to Lord North's administration, he from the beginning occupied an independent position, and in 1782 supported the address of the Commons against an offensive war with America. From this time he became a declared follower of Fox and Burke, with the latter of whom he gradually came to be on terms of great intimacy. He was created Baron Minto in 1797, and after filling several diplomatic posts with great success became in 1807 governor-general of India. He was created Earl of Minto and Viscount Melgund in 1813. He returned to England in 1814, and died on June 21st of that year.

MINUCIUS FELIX, MARCUS, one of the earliest, if not the earliest, of the Latin apologists for Christianity. Of his personal history nothing is known, and even the date at which he wrote can be only approximately ascertained.

MINUET (Fr. *Menuet*, from [*pas*] *menus*), a very graceful kind of dance, consisting of a couple, a high step, and a balance. Its invention is universally ascribed to the inhabitants of Poitou. The melody begins with the down beat, and contains three crotchets in a bar. The music is made up of two strains, which, from being repeated, are called *reprises*, each consisting of eight or more bars, but very rarely of an odd number. The finest minuets we possess are those in Handel's *Samson* and Mozart's *Don Giovanni*.

MIRABEAU, HONORÉ GABRIEL RIQUETI, COMTE DE, one of the greatest statesmen and orators France has ever produced, was born at Bignon, near Nemours, on March 9, 1749. When but three years old he had a virulent attack of confluent smallpox which left his face forever disfigured, and contributed not a little to nourish his father's dislike to him. His early education was conducted by Lachabeaussière, and he was entered at a pension militaire at Paris, kept by an Abbé Choquet. On leaving this school in 1767 he received a commission in the cavalry regiment of the Marquis de Lambert, which his grandfather had commanded years before. He at once began love making, and in spite of his ugliness succeeded in winning the heart of the lady to whom his colonel was attached, which led to such scandal that his father obtained a *lettre de cachet*, and the young scapegrace was imprisoned in the isle of Rhé. The love affairs of Mirabeau form quite a history by themselves, and a well-known history, owing to the celebrity of the letters to Sophie; and the behavior of the marquis in perpetually imprisoning his son is equally well known, and as widely blamed. Mirabeau was not a statesman of the Alcibiades type, and he did not develop his great qualities of mind and character until his youthful excesses were over.

On being released from his first imprisonment, the young count, who had always intended to continue his military career, obtained leave to accompany as a volunteer the French expedition which was to effect the reduction of Corsica. The conquest was one of sheer numerical strength, for the whole population was on the side of Paoli, and Mirabeau, perceiving the value of

public opinion, is said to have written a treatise on the oppression the Genoese had formerly exercised over the island, which the government was ready to publish had not the Marquis de Mirabeau thought fit to destroy it because of its divergence from his own philosophical and economical views. For his services in Corsica Mirabeau was made a captain of dragoons, though not in any particular regiment, and on his return his father endeavored to make use of the literary ability he had shown for the advancement of his own economical theories. He tried to keep on good terms with his father, though he could not advocate all his ideas, and even went so far in 1772 as to marry a rich heiress; a daughter of the Marquis de Marignane, whose alliance his father had procured for him. He did not live happily with her, and in 1774 was ordered into semi-exile in the country, at his father's request, where he wrote his earliest extant work, the *Essai sur le Despotisme*. His violent disposition now led him to quarrel with a country gentleman who had insulted his sister, and his semi-exile was changed by *lettre de cachet* into imprisonment in the Chateau d'If. In 1775 he was removed to the castle of Joux, to which, however, he was not very closely confined, having full leave to visit in the town of Pontarlier. Here he met Marie Thérèse de Monnier, his Sophie as he called her, a married woman, for whom he conceived a violent passion. The affair ended by his escaping to Switzerland, where Sophie joined him; they then went to Holland, where he lived by hack-work for the booksellers; meanwhile Mirabeau had been condemned to death at Pontarlier for *rapt et vol*, of which he was certainly not guilty, as Sophie had followed him of her own accord, and in May, 1777, he was seized by the French police, and imprisoned by a *lettre de cachet* in the castle of Vincennes. There he remained three years and a half, and with his release ends the first and most disgraceful period of his life. During his imprisonment he seems to have learned to control his passions from their very exhaustion, for the early part of his confinement is marked by the indecent letters to Sophie (first published in 1793), and the obscene *Erotica Biblion* and *Ma Conversion*, while to the later months belongs his first political work of any value, the *Lettres de Cachet*. The *Essai sur le Despotisme* was an ordinary but at times eloquent declamation, showing in its illustrations a wide miscellaneous knowledge of history, but the *Lettres de Cachet* exhibits a more accurate knowledge of French constitutional history skillfully applied to an attempt to show that an existing actual grievance was not only philosophically unjust, but constitutionally illegal.

With his release from Vincennes begins the second period of Mirabeau's life. He found that his Sophie was an idealized version of a rather common and ill-educated woman, and she speedily consoled herself with the affection of a young officer, after whose death she committed suicide. Mirabeau first set to work to get the sentence of death still hanging over him reversed, and by his eloquence not only succeeded but got M. de Monnier condemned in the costs of the whole law proceedings. From Pontarlier he went to Aix, where he claimed the court's order that his wife should return to him. About this time began his connection with Madame de Nehra, which sweetened the ensuing years of toil and brought out the better points of his character. She was the daughter of Zwier van Haren, a Dutch statesman and political writer, and was a woman of a far higher type than Sophie, more educated, more refined, and more capable of appreciating Mirabeau's good points and helping him to control his passions. After a period of work in Holland he betook himself to England, where his treatise on *Lettres de Cachet* had

been much admired. Romilly was introduced to Mirabeau by D'Ivernois, and readily undertook to translate the *Considerations on the Order of Cincinnati*.

He had read a pamphlet published in America attacking the proposed order, which was to form a bond of association between the officers who had fought in the American War of Independence against England; the arguments struck him as true and valuable, so he rearranged them in his own fashion, and rewrote them in his own oratorical style. On his return to Paris he had become acquainted with Clavières, a Genevese exile, who was minister of finance during the Revolution, and who now introduced him to a banker named Panchaud. Mirabeau, though ever ready to take money for what he wrote, never sold his opinions, or wrote what he did not really believe. The very eloquence of his style rests upon the enthusiastic conviction that he himself was right, and those who differed from him were stupidly and wilfully wrong. A pamphlet brought him into a controversy with Beaumarchais, who certainly did not get the best of it, but it lost him any chance of literary employment from Government. However, his ability was too great to be neglected, and after a preliminary tour in the early spring of 1786 he was dispatched in June, 1786, on a secret mission to the court of Prussia, from which he returned in January, 1787, and of which he gave a full account in his *Histoire Secrète de la Cour de Berlin*. The months he spent at Berlin were important ones in the history of Prussia, for in them Frederick the Great died. He failed to conciliate the new king Frederick William; and thus ended Mirabeau's one attempt at diplomacy. He had offered himself as a candidate for the office of secretary to the Assembly of Notables which the king had just convened, and to bring his name before the public published another financial work, the *Denonciation de l'Agiotage*, dedicated to the king and notables, which abounded in such violent diatribes that he not only lost his election, but was obliged to retire to Tongres; and he further injured his prospects by publishing the reports he had sent in during his secret mission at Berlin. But 1789 was at hand; the states-general was summoned; Mirabeau's period of probation was over, and he was at last to have that opportunity of showing his great qualities both as statesman and as orator on a worthy arena.

On hearing of the king's determination to summon the states-general, Mirabeau started for Provence, and offered to assist at the preliminary conference of the noblesse of his district. They rejected him; he appealed to the *tiers état*, and was returned both for Aix and for Marseilles. He elected to sit for the former city, and was present at the opening of the states-general on May 4, 1789. From this time the record of Mirabeau's life forms the best history of the first two years of the Constituent Assembly, for at every important crisis his voice is to be heard, though his advice was not always followed. It is impossible here to detail minutely the history of these two eventful years; it will be rather advisable to try and analyze the manner in which Mirabeau regarded passing events, and then show how his policy justifies our analysis.

Mirabeau possessed at the same time great logical acuteness and most passionate enthusiasm; he was, therefore, both a statesman and an orator, and the interest of the last two years of his life lies mainly in the gradual but decided victory of the statesmanlike and practical over the impulsive and oratorical qualities.

In the first stage of the history of the states-general Mirabeau's part was very great. He was soon recognized as a leader, because he always knew his own mind, and was prompt at emergencies. To him is to be attributed the successful consolidation of the National Assembly,

and the address to the king for the withdrawal of the troops assembled by De Broglie. When the taking of the Bastille had assured the success of the Revolution, he was the one man who warned the Assembly of the futility of passing fine-sounding decrees and the necessity for acting. He declared that the famous night of August 4th was but an orgy, giving the people an immense theoretical liberty while not assisting them to practical freedom, and overthrowing the old régime before a new one could be constituted. Still more did he show his foresight when he attacked the dilatory behavior of the Assembly, which led to the catastrophes of October 5th and 6th. He implored the Assembly to strike while the iron was hot, and at once solve in a practical manner the difficult problems presented by the abolition of feudalism. But the Assembly consisted of men inexperienced in practical politics, who dreamed of drawing up an ideal constitution preluded by a declaration of rights in imitation of the Americans; and for two months the Assembly discussed in what words the declaration should be expressed, while the country was in a state of anarchy, declaring old laws and customs abolished and having no new ones to obey or follow, disowning the old administrative system and having no new one yet instituted, while Paris was starving and turbulent, and the queen and her friends planning a counter-revolution. The result of these two months' theorizing was the march of the women to Versailles, and the transfer of the king to Paris. Mirabeau now saw clearly that his eloquence would not enable him to guide the Assembly by himself, and that he must therefore try to get some support. He wished to establish a strong ministry, which should be responsible like an English ministry, but to an assembly chosen to represent the people of France better than the English House of Commons then represented England. He attempted to form an alliance with Lafayette, but the general was as obstinate as Mirabeau himself, and had his own theories about a new French constitution. Mirabeau tried for a time, too, to act with Necker, and obtained the sanction of the Assembly to Necker's financial scheme, not because it was good, but because, as he said, "no other plan was before them, and something must be done."

Hitherto weight has been laid on the practical side of Mirabeau's political genius; his ideas with regard to the Revolution after October 5th and 6th must now be examined, and this can be done at length, thanks to the publication of Mirabeau's correspondence with La Marck, a study of which is indispensable for any correct knowledge of the history of the Revolution between 1789 and 1791. Mirabeau followed up his *Mémoire* by a scheme of a great ministry to contain all men of mark—Necker as prime minister, "to render him as powerless as he is incapable, and yet preserve his popularity for the king," the archbishop of Bordeaux, the Duc de Liancourt, the Duc de la Rochefoucauld, La Marck, Talleyrand bishop of Autun at the finances, Mirabeau without portfolio, Target mayor of Paris, Lafayette generalissimo to reform the army, Ségur (foreign affairs), Mounier, and Chapelier. This scheme got noised abroad, and was ruined by a decree of the Assembly of November 7, 1789, that no member of the Assembly could become a minister; this decree destroyed any chance of that necessary harmony between the ministry and the majority of the representatives of the nation existing in England, and so at once overthrew Mirabeau's present hopes and any chance of the permanence of the constitution then being devised. The queen utterly refused to take Mirabeau's counsel, and La Marck left Paris. However, in April, 1790, he was suddenly recalled by the Comte de Mercy-Argenteau, the Austrian ambassador at Paris,

and the queen's most trusted political adviser, and from this time to Mirabeau's death he became the medium of almost daily communications between the latter and the queen. From the month of May, 1790, to his death in April, 1791, Mirabeau remained in close and suspected, but not actually proved connection with the court, and drew up many admirable state-papers for it. In return the court paid his debts; but it ought never to be said that he was bribed, for the gold of the court never made him swerve from his political principles—never, for instance, made him a royalist.

On the great subject of peace and war he supported the king's authority, and with some success. Mirabeau almost alone of the Assembly understood the position of the army under a limited monarchy. Contrary to the theorists, he held that the soldier ceased to be a citizen when he became a soldier; he must submit to be deprived of his liberty to think and act, and must recognize that a soldier's first duty is obedience.

Mirabeau held it to be just that the French people should conduct their Revolution as they would, and that no foreign nation had any right to interfere with them, so long as they kept themselves strictly to their own affairs. But he knew also that neighboring nations looked with unquiet eyes on the progress of affairs in France, that they feared the influence of the Revolution on their own peoples, and that foreign monarchs were being prayed by the French émigrés to interfere on behalf of the French monarchy. To prevent this interference, or rather to give no pretext for it, was his guiding thought as to foreign policy. He had been elected a member of the comité diplomatique of the Assembly in July, 1790, and became its reporter at once, and in this capacity he was able to prevent the Assembly from doing much harm in regard to foreign affairs.

In the beginning of 1791 his death was very near; and he knew it to be so. The wild excesses of his youth and their terrible punishment had weakened his strong constitution, and his parliamentary labors completed the work. In March his illness was evidently gaining on him, to his great grief, because he knew how much depended on his life, and felt that he alone could yet save France from the distrust of her monarch and the present reforms and from the foreign interference, which would assuredly bring about catastrophes unparalleled in the history of the world. His vanity appears in its most gigantic proportions in his last utterances during his illness; but many of them have something grand in their sound, as his last reported expression when he looked upon the sun—"If he is not God, he is at least His cousin-german." When he could speak no more he wrote with a feeble hand the one word "dormir," and on April 2, 1791, he died.

MIRABEAU, VICTOR RIQUETI, MARQUIS DE, himself a distinguished author and political economist, but more famous as the father of the great Mirabeau, was born at Pertuis near the old Chateau de Mirabeau on October 4, 1715. He was brought up very sternly by his father, and in 1729 joined the army. In 1737 he came into the family property on his father's death. In 1756 Mirabeau made his first appearance as a political economist by the publication of his *Ami des Hommes ou traite de la population*. In 1760 he published his *Theorie de l'Impot*, in which he attacked with all the vehemence of his son the farmers-general of the taxes, who got him imprisoned for eight days at Vincennes, and then exiled to his country estate at Bignon. He was recognized as a leader of political thinkers by Prince Leopold of Tuscany, afterward emperor, and by Gustavus III. of Sweden, who in 1772 sent him the grand cross of the order of Vasa. His marriage had not been happy; he had separated from his wife by

mutual consent in 1762, and had, he believed, secured her safely in the provinces by a *lettre de cachet*, when in 1772 she suddenly appeared in Paris, and soon after commenced proceedings for a separation. His wife would not let him rest; her plea was rejected in 1777, but she renewed her suit, and, though the great Mirabeau had pleaded his father's case, was successful in 1781, when a decree of separation was pronounced. This trial had quite broken the health of the marquis, as well as his fortune; he sold his estate at Bignon, and hired a house at Argenteuil, where he lived quietly till his death on July 11, 1789.

MIRAGE. The density of the air generally diminishes with the height; rays of light proceeding obliquely upwards from an object then become more and more nearly horizontal, but generally pass away into space. Assume the density to diminish with the height with unusual rapidity, as when the air is cooler the nearer it is to the earth; the obliquely ascending rays may become quite horizontal and then bend down towards the earth, reaching it at a distant point. The observer at that point sees distant objects at an unusual elevation, or sees above the true horizon erect images of objects which may or may not be beyond the horizon. This is what the sailors generally call *looming*, and it causes us sometimes to see distant coasts with unusual distinctness, or to see from a mountain top a double horizon, such as is regularly seen in the autumn mornings from the Colorado foot-hills across the prairies. If the layer of air near the earth, say 50 or 100 feet thick, be uniformly dense, as in the cold air over a frozen sea, and a warmer stratum lie above it in which the density rapidly diminishes, so that the rays are brought back to the earth as above, we find, on tracing the path of the rays reaching the observer from the top and the bottom of the distant object respectively, that these rays have crossed one another in the hot stratum; the observer, therefore, seems to see the object suspended in the air magnified and upside down; and this may happen while the observer sees the object itself by direct vision through the lower air. An intermediate stratum between a cold ground-stratum and a warm upper stratum gives rise to more than one image, inverted or erect, or both, according to positions. In the mirage of the Sahara and other arid deserts the conditions are reversed; the air is hottest nearest the hot sand; skylight rays descending, become bent upwards; the eye receives an impression resembling that produced by the reflection of skylight from water; the illusion is rendered more perfect by the flickering due to convection currents, which causes an appearance like a breeze playing over the illusory water.

MIRAMON, MIGUEL, a Mexican soldier of French extraction, was born in the city of Mexico, September 29, 1832, and shot along with the emperor Maximilian at Queretaro, June 19, 1867. While still a student he helped to defend the military academy at Chapultepec against the forces of the United States; and, entering the army in 1852, he rapidly came to the front during the civil wars that disturbed the country. It was largely due to Miramon's support of the ecclesiastical party against Alvarez and Comonfort that Zuloaga was raised to the presidency; and in 1859 he was called to succeed him in that office. Decisively beaten, however, by the liberals, he fled the country in 1860, and spent some time in Europe, earnestly advocating foreign intervention in Mexican affairs; and when he returned it was as a partisan of Maximilian. His ability as a soldier was best shown by his double defense of Pueblo in 1856.

MIRANDA, FRANCESCO, was born at Santa Fé in New Granada in 1754. He entered the army, and served against the English in the American War of In-

dependence. The success of that war inspired him with a hope of being the Washington of his own country, and a belief that the independence of Spanish America would increase its material prosperity. With these views he began to scheme a revolution, but his schemes were discovered and he had only just time to escape to the United States. Thence he went to England, where he was introduced to Pitt, but chiefly lived with the leading members of the opposition—Fox, Sheridan, and Romilly.

In April, 1792, he went to Paris, with introductions to Pétion and the leading Girondists, hoping that men who were working so hard for their own freedom might help his countrymen in South America. France had too much to do in fighting for its own freedom to help others; but Miranda's friends sent him to the front with the rank of general of brigade. He distinguished himself under Dumouriez, was intrusted in February, 1793, with the conduct of the siege of Maestricht, and commanded the left wing of the French army at the disastrous battle of Neerwinden. Although he had given notice of Dumouriez's projected treachery, he was put on his trial for treason on May 12. He was unanimously acquitted, but was soon again thrown into prison, and not released till after the 9th Thermidor. He again mingled in politics, and was sentenced to be deported after the struggle of Vendémiaire. Yet he escaped and continued in Paris till the *coup d'état* of Fructidor caused him finally to take refuge in England. Aided by two American citizens, Colonel Smith and Mr. Ogden, he equipped a small ship, the *Leander*, in 1806, and with the help of the English admiral Sir A. Cochrane made a landing near Carácas, and proclaimed the Colombian republic. He had some success, and would have had more had not a false report of peace between France and England caused the English admiral to withdraw his support. At last in 1810 came his opportunity; the events in Spain which brought about the Peninsular War had divided the authorities in Spanish America, some of whom declared for Joseph Bonaparte, others for Ferdinand VII., while others again held to Charles IV. At this moment Miranda again landed, and had no difficulty in getting a large party together who declared a republic both in Venezuela and New Granada or Columbia. But Miranda's desire that all the South American colonies should rise, and a federal republic be formed, awoke the selfishness and pride of individual provincial administrations, and thus weakened the cause, which further was believed to be hateful to heaven owing to a great earthquake on March 26, 1812. The count of Monte Verde, the Bourbon governor, had little difficulty in defeating the dispirited forces of Miranda, and on July 26th the general capitulated on condition that he should be deported to the United States. The condition was not observed; Miranda was moved from dungeon to dungeon, and died in 1816 at Cadiz.

MIRANDOLA. See PICO.

MIRKHOND. Mohammed bin Kháwandsháh bin Mahmúd, commonly called Mirkhwánd or Mirkhâwand, more familiar to Europeans under the name of Mirkhond, was born in 1433. The discovery of older works on Asiatic history has diminished to some extent the value of Mirkhond's *Rauzat*, but it still maintains its high position as one of the most marvelous achievements in literature from the pen of one man. Mirkhond died in 1498.

MIKOPOLIE, a town of Russia, situated in the government of Kursk, district of Suja, eighty-three miles southwest of Kursk and twenty-five miles from the Sumy railway station. Population, 12,000.

MIRROR. It is only since the early part of the sixteenth century that mirrors have become articles of

household furniture and decoration. Previous to that time—from the twelfth to the end of the fifteenth century—pocket mirrors or small hand mirrors carried at the girdle were indispensable adjuncts to ladies' toilets. The pocket mirrors consisted of small circular plaques of polished metal fixed in a shallow circular box, covered with a lid. Mirror cases were chiefly made of ivory, carved with relief representations of love or domestic scenes, hunting, and games, and sometimes illustrations of popular poetry or romance. Gold and silver, enamels, ebony, and other costly materials were likewise used for mirror cases, on which were lavished the highest decorative efforts of art workmanship and costly jewelry. The mirrors worn at the girdle had no cover, but were furnished with a short handle. In 625 Pope Boniface IV. sent Queen Ethelberga of Northumbria a present of a silver mirror; and there is ample evidence that in early Anglo-Saxon times mirrors were well known in England. It is a remarkable fact that on many of the sculptured stones of Scotland, belonging probably to the seventh, eighth, or ninth century, representations of mirrors, mirror cases, and combs occur. The method of backing glass with thin sheets of metal for mirrors was well known in the Middle Ages at a time when steel and silver mirrors were almost exclusively employed. It is known that small convex mirrors were commonly made in southern Germany before the beginning of the sixteenth century, and these continued to be in demand under the name of bull's-eyes till comparatively modern times. It was, however, in Venice that the making of glass mirrors on a commercial scale was first developed; and that enterprising republic enjoyed a rich and much-prized monopoly of the manufacture for about a century and a half.

The manufacture of glass mirrors, with the aid of Italian workmen, was practiced in England by Sir Robert Mansel early in the seventeenth century, and about 1670 the duke of Buckingham was concerned in a glass-work at Lambeth, where flint glass was made for looking-glasses. These old English mirrors, with beveled edges in the Venetian fashion, are still well known.

The Venetians guarded with the utmost jealousy the secrets of their varied manufactures, and gave most exceptional privileges to those engaged in such industries.

The term "silvering," as applied to the formation of a metallic coating on glass for giving it the properties of a mirror, was till quite recently a misnomer, seeing that till about 1840 no silver was used in the process. Now, however, a large proportion of mirrors are made by depositing on the glass a coating of pure silver, and the old amalgamation process is comparatively little used.

The process of amalgamation consists in applying a thin amalgam of tin and mercury to the surface of glass, which is done on a perfectly flat and horizontal slab of stone bedded in a heavy, iron-bound wooden frame, with a gutter running round the outer edge. On the surface of this table, which must be perfectly smooth and level, is spread a sheet of tin-foil, somewhat larger than the glass to be operated on, and after all folds and creases have been completely removed, by means of stroking and beating with a covered wooden rubber, the process of "quickenening" the foil is commenced. A small quantity of mercury is rubbed lightly and quickly over the whole surface, and the scum of dust, impure tin, and mercury is taken off. Mercury is then poured upon the quickened foil, until there is a body of it sufficient to float the glass to be silvered (about one-quarter of an inch deep), and, the edge at one of the sides having been cleared of the scum peculiar to mercury, the glass (scrupulously cleaned simultaneously with the above operations) is slid from that side over the surface

of the mercury. Weights are placed over the surface until the greater part of the amalgamated mercury is pressed out, the table is then tilted diagonally, by means of dumb-screws, and all superfluous mercury finds its way to the gutter. The glass is left twenty-four hours under weights; it is then turned over, silvered side up, and removed to a drainer with inclining shelves, where by slow degrees, as it dries and hardens, it is brought to a vertical position, which in the case of large sheets may not be arrived at in less than a month. This process yields excellent results, producing a brilliant silver-white metallic luster which is only subject to alteration by exposure to high temperature, or by contact with damp surfaces; but the mercurial vapors to which the workmen are exposed give rise to the most distressing and fatal affections.

MIRZÁPUR, a district in the Northwestern Provinces of India, has an area of 5,217 square miles. It is crossed from east to west by the Vindhya and Káimur ranges. A central jungly plateau connects these, and separates the valley of the Ganges from that of the Son. The population in 1892, was 1,015,203 (males, 520,496; females, 494,707), of whom 949,644 were Hindus, 64,800 Mohammedans, and 750 Christians.

MIRZÁPUR, chief town and administrative headquarters of the above district, is situated on the south bank of the Ganges, fifty-six miles below Allahábád. The population in 1901 was 79,787, of whom 67,000 were Hindus and 12,753 Mohammedans.

MISDEMEANOR. The word misdemeanor is applied to all those crimes and offenses for which the law has not provided a particular name. Stephen, in his *Digest of the Criminal Law*, adopts the following mode of distinguishing between misdemeanor and other crimes. "Every crime is either treason, felony, or misdemeanor. Every crime which amounts to treason or felony is so denominated in the definitions of crimes hereinafter contained. All crimes not so denominated are misdemeanors." It is customary to speak of misdemeanor as implying a less degree of crime than felony (see FELONY). "Misdemeanors," observes Russell, "have been sometimes termed *misprisions*; indeed the word misprision, in its larger sense, is used to signify every considerable misdemeanor which has not a certain name given to it in the law, and it is said that a misprision is contained in every felony whatsoever, so that the offender may be prosecuted for misprision at the option of the crown." Misprision, in a more restricted sense (or negative misprision), is the concealment of an offense. The rule as to punishment, when no express provision has been made by law, is that "every person convicted of a misdemeanor is liable to fine and imprisonment without hard labor (both or either), and to be put under recognizances to keep the peace and be of good behavior at the discretion of the court."

In New York and some other States of the American Union the legislature has defined felony as any crime which is or may be punishable with death or imprisonment in a State prison, all other crimes being misdemeanors.

MISHNAH. The *Mishnah*, in the most familiar application of the name, is the great collection of legal decisions by the ancient rabbis which forms in each Talmud the text on which the *Gemara* rests, and so is the fundamental document of the oral law of the Jews.

Although the word *Mishnah* is not found in the Bible, it is no doubt a classical Hebrew term, signifying something closely akin to *Mishneh*. The practical significations of *Mishnah* are seven in number: (1) repetition, *i.e.*, tradition; (2) recitation from memory, in contradistinction to reading from a book; (3) study; (4) instruction; (5) system; (6) a paragraph of the

Mishnah: it is invariably employed in this sense in the Babylonian Talmud, and is identical with the word *Halakhah*, used for the same purpose, in the Palestinian Talmud; and (7) the collection of the decisions of the whole "oral law," *i.e.*, the *Mishnah* in the concrete sense.

MISKOLCZ, capital of the Cis-Tisian county of Borsod, Hungary, is situated in a valley watered by the Szina, ninety miles northeast from Budapest, with which, as also with Debreczen and Kassa (Kaschau), it is directly connected by railway. Population (1900), 43,096.

MISREPRESENTATION. See FRAUD.

MISSAL, the book containing the liturgy, or office of the mass, of the Latin Church. This name began to supersede the older word *Sacramentary* from about the middle of the eighth century.

The first pages of the modern Roman missal are occupied with the *Calendar* and a variety of explanations relating to the year and its parts, and the manner of determining the movable feasts. The general rubrics follow, explaining what are the various kinds of mass which may be celebrated, prescribing the hours of celebration, the kind and color of vestments to be used, and the ritual to be followed, and giving directions as to what is to be done in case of various defects or imperfections which may arise. The *Preparatio ad Missam*, which comes next, is a short manual of devotion containing psalms, hymns, and prayers to be used as opportunity may occur before and after celebration. Next comes the proper of the season, occupying more than half of the entire volume. It contains the proper introit, collect (one or more), epistle, gradual (tract or sequence), gospel, offertory, secreta (one or more), communion, and post-communion for every Sunday of the year, and also for the festivals and ferias connected with the ecclesiastical seasons, as well as the offices peculiar to the ember days, Holy Week, Easter, and Whitsuntide. Between the office for Holy Saturday and that for Easter Sunday the ordinary of the mass, with the solemn and proper prefaces for the year, and the canon of the mass are inserted. The proper of the season is followed by the proper of the saints, containing what is special to each saint's day in the order of the calendar, and by the *Commune Sanctorum*, containing such offices as the common of one martyr and bishop, the common of one martyr not a bishop, the common of many martyrs in paschal time, the common of many martyrs out of paschal time, and the like. A variety of masses to be used at the feast of the dedication of a church, of masses for the dead, and of votive masses (as for the sick, for persons journeying, for bridegroom and bride) follow, and also certain benedictions. Most missals have an appendix also containing certain local masses of saints to be celebrated "ex indulto apostolico."

MISSIONS. Christian missions had their origin in the example and the command of our Lord Himself; and the unparalleled boldness on the part of the Founder of Christianity, which dared to anticipate for the Christian faith a succession of efforts which should never cease to cause its propagation to be undertaken as "a distinct and direct work," has been justified by the voice of history. Whereas other religions have spread from country to country as component parts of popular opinion, have traveled with migration or conquest, have passed in the train of things and by the usual channels of communication, the first foundations of the church had hardly been laid before individual missionary activity marked the life of each one of the circle of the apostles.

Of the actual details of their labors we know but little. Three only of the immediate followers of the Savior

have any conspicuous place in the apostolic records and the most illustrious in the whole domain of missionary activity, St. Paul, did not belong to the original twelve. His activity took the form of journeys and voyages, chiefly to large towns, where his message found a point of contact either with the Jewish synagogue or with the aspirations of the Gentile world. The result of his labors and of those of his successors was that toward the middle of the second century the church had gradually extended its conquests through Asia Minor, Greece, Italy, southern Gaul, and northern Africa. Ecclesiastical history can tell but little of the church's earliest teachers, and the infancy of many of the primitive congregations is wrapped in hopeless darkness. Whatever was effected was due to the evangelizing labors of individual bishops and clergy, who occupied themselves "in season and out of season," and toiled zealously and effectively in the spread of the church, though leaving no record of their devotion.

With the fifth century the church found a very different element proposed to her missionary energies and zeal. Her outposts of civilization had scarcely been planted when she was confronted with numberless hordes which had long been gathering afar off in their native wilds, and which were now precipitated over the entire face of Europe. Having for some time ceased to plead for toleration, and learned to be aggressive, she not only stood the shock of change but girded herself for the difficult work of calming the agitated elements of society, of teaching the nations a higher faith than a savage form of nature worship, of purifying and refining their recklessness, independence, and uncontrollable love of liberty, and fitting them to become members of an enlightened Christendom.

The first pioneers who went forth to engage in this difficult enterprise came from the secluded Celtic churches of Ireland and the Scottish Highlands, which, though almost forgotten amid the desolating contest which was breaking up the Roman world, were no sooner founded than they sent forth "armies of Scots" to pour back upon the Continent the gifts of civilization and the gospel. Of many who deserve mention in connection with this period, the most prominent were—Columba, the founder of the famous monastery of Iona, and the evangelizer of the Albanian Scots and northern Picts; Aidan, the apostle of Northumbria; Columbanus, the apostle of the Burgundians of the Vosges; Calloch or Gallus, the evangelizer of northeastern Switzerland and Alemannia; Kilian, the apostle of Thuringia; and Trudpert, the martyr of the Black Forest. The energy which warriors were accustomed to put forth in their efforts to conquer was "exhibited in the enterprise of conversion and teaching" by Wilfrid on the coast of Friesland, by Willibrord in the neighborhood of Utrecht, by the martyr-brothers Ewald or Hewald among the "old" or continental Saxons, by Swibert the apostle of the tribes between the Ems and the Yssel, by Adelbert, a prince of the royal house of Northumbria, in the regions north of Holland, by Wursing, a native of Friesland, and one of the disciples of Willibrord, in the same region, and last, not least, by the famous Winfrid or Boniface, the "apostle of Germany," who went forth first to assist Willibrord at Utrecht, then to labor in Thuringia and Upper Hessa, then, with the aid of his kinsmen Wunibald and Willibald, their sister Walpurga, and her thirty companions, to consolidate the work of earlier missionaries, and finally to die a martyr on the shore of the Zuyder Zee.

Devoted, however, as were the labors of Boniface and his disciples, the battle was not yet nearly won. All that he and they and the emperor Charlemagne after them achieved for the fierce untutored world of the

eight century seemed to have been done in vain when, in the ninth, "on the north and northwest the pagan Scandinavians were hanging about every coast and pouring in at every inlet; when on the east the pagan Hungarians were swarming like locusts and devastating Europe from the Baltic to the Alps; when on the south and southeast the Saracens were pressing on and on with their victorious hosts. It seemed then as if every pore of life were choked, and Christendom must be stifled and smothered in the fatal embrace." But it was even now that one of the most intrepid of missionary enterprises was undertaken, and the devoted Anskar went forth and proved himself a true apostle of Denmark and Sweden.

Thus the "gospel of the kingdom" was successively proclaimed to the Roman, the Celtic, the Teutonic, and the Scandinavian world. A contest still more stubborn remained with the Slavonic tribes, with their triple and many-headed divinities, their powers of good and powers of evil, who could be approached only with fear and horror, and propitiated only with human sacrifices. Mission work commenced in Bulgaria during the latter part of the ninth century; thence it extended to Moravia, where two Greek missionaries—Cyril and Methodius—provided for the people a Slavonic Bible and a Slavonic Liturgy; thence to Bohemia, and so onward to the Scythian wilds and level steppes, where arose the Russian kingdom of Ruric the Northman, and where about the close of the tenth century the Eastern Church silently and almost unconsciously bore into the world her mightiest offspring. As late as 1230 human sacrifices were still being offered up in Prussia and Lithuania, and, in spite of all the efforts of the Teutonic Knights to expel by force the last remains of heathenism from the face of Europe, idolatrous practices still lingered among the people, while in the districts inhabited by Lapps, though successful missions had been inaugurated as early as 1335, Christianity cannot be said to have become the dominant religion till at least two centuries later.

The mention of the order of the Teutonic Knights reminds us how the crusading spirit had affected Christendom, and exchanged the patience of a Boniface or an Anskar for the fiery zeal of the warrior of the cross. Out of the crusades arose other efforts to bear the banner of the cross into the lands of the East, and to develop the work which Nestorian missionaries from Baghdad, Edessa, and Nisibis had already inaugurated along the Malabar coast, in the island of Ceylon, and in the neighborhood of the Caspian Sea. In 1245 the Roman pontiff sent two embassies, one to charge the Mongol warriors to desist from their desolating inroads into Europe, the other to attempt to win them over to the Christian faith. Their exertions were seconded in 1253 by the labors of another Franciscan whom Louis IX. of France sent forth from Cyprus, while in 1274 the celebrated traveler Marco Polo, accompanied by two learned Dominicans, visited the court of Kublai-khan, and at the commencement of the fourteenth century two Franciscans penetrated as far as Peking, and kept alive a flickering spark of Christianity in the Tartar kingdom, even translating the New Testament and the Psalter into the Tartar language, and training youths for a native ministry.

These tentative missions in the East were supplemented by others on a larger scale. In 1486 the Cape of Good Hope was rounded by Dias, and in 1508 the foundations of the Portuguese Indian empire were laid by Albuquerque. Columbus in 1492 landed on San Salvador, and the voyages of the Venetian Cabot along the coast of North America opened up a new world to missionary enterprise. These bold discoverers had

secured the countenance of the pope on the condition that wherever they might plant a flag they should be also zealous in promoting the extension of the Christian faith. Thus a grand opportunity was given to the churches of Portugal and Spain.

In the sixteenth century the great organization of the Jesuits came into existence, and one of the first of Loyola's associates, Francis Xavier, was also one of the greatest and most zealous missionaries of his or any other era. Encouraged by the joint coöperation of the pope and of John III. of Portugal, and strongly tinged like Loyola with ideas of chivalry and self-devotion, he disembarked at Goa on May 6, 1542, and before his death on the Isle of St. John (Hiang-Shang) December 2, 1552, he had roused the European Christians of Goa to a new life; labored with singular success among the Paravars, a fisher caste near Cape Comorin, gathered many converts in the kingdom of Travancore, visited the island of Malacca, made his way to and founded a mission in Japan, thence revisited Goa, and impelled by the quenchless desire to unfurl the banner of the cross in China, had set out thither to fall a victim to malignant fever at the early age of forty-six, within sight of that vast empire whose conversion had been the object of his holy ambition.

The immediate successor of Xavier, Antonio Criminallis, was regarded by the Jesuits as the first martyr of their society (1562). Matteo Ricci, an Italian by birth, was also an indefatigable missionary in China for twenty-seven years, while the peculiar methods of unholy compromise with Brahmanism in India followed by Robert de' Nobili drew down the condemnatory briefs of pope after pope, and were fatal to the vitality of his own and other missions. Other representatives of the same order worked with success in evangelizing the Spanish settlement of Paraguay in 1582, while their defeated foes the Huguenots sent forth under a French knight of Malta a body of devoted men to attempt the formation of a Christian colony at Rio Janeiro. By the close of the sixteenth century the unflagging zeal of the Jesuits led to a more complete development and organization of the missionary system of the Roman Church. To give unity and solidity to the work of missions, a committee of cardinals was appointed under the name of the "Congregatio de propaganda fide," and to it was intrusted the entire management of the mission, conducted under the superintendence of the pope. The scheme originated with Gregory XIII., but was not fully organized till forty years afterward, when Gregory XV gave it plenary authority by a bull dated June 2, 1622.

This last period of missionary activity is distinguished in a special degree by the exertions of societies for the development of mission work.

As contrasted with the colossal display of power on the part of the Church of Rome, it must be allowed that the churches which in the sixteenth century broke off from their allegiance to the Latin center at first presented a great lack of anxiety for the extension of the gospel and the salvation of the heathen. During the Protectorate, in 1649, an ordinance was passed for "the promoting and propagating of the gospel of Jesus Christ in New England" by the erection of a corporation, to be called by the name of the President and Society for the Propagation of the Gospel in New England, to receive and dispose of monies for the purpose, and a general collection was ordered to be made in all the parishes of England and Wales; and Cromwell himself desired a scheme for setting up a council for the Protestant religion, which should rival the Roman Propaganda, and consist of seven councillors and four secretaries for different provinces. On the restora-

tion of the monarchy, through the influence of Richard Baxter with Lord Chancellor Hyde, the charter already granted by Cromwell was renewed, and its powers were enlarged. For now the corporation was styled "The Propagation of the Gospel in New England and the parts adjacent in America," and its object was defined to be "not only to seek the outward welfare and prosperity of those colonies, but more especially to endeavor the good and salvation of their immortal souls, and the publishing the most glorious gospel of Christ among them."

The needs of the colonial church soon excited the attention of others also, and great efforts were made by Bishop Beveridge, Archbishop Wake, Archbishop Sharpe, Bishop Gibson, and afterward by the philosophic Bishop Berkeley, and Bishop Butler, the famous author of the *Analogy*, to develop the colonial church and provide for the wants of the Indian tribes.

With the establishment of the Society for the Propagation of the Gospel in 1701, the era of the activity of societies for carrying out mission work may be said to commence, though the opening of the eighteenth century saw other movements set on foot for the same object. Thus in 1705 Frederick IV. of Denmark founded a mission on the Coromandel coast, and inaugurated the labors of Ziegenbalg, Schultze, and Schwartz, whose devotion and success told with such remarkable reflex influence on the church at home. Again in 1731 the Moravians illustrated in a signal degree the growing consciousness of obligation toward the heathen. Literally with "neither bread nor scrip," they went forth on their pilgrimage, and within ten years they had established missions in the islands of the West Indies, in South America, Surinam, Greenland, among the North American tribes, in Lapland, Tartary, Algiers, Guinea, the Cape of Good Hope, and Ceylon.

Such were the preparations for the more general movements during the last hundred years, and the manifestation of missionary zeal on a scale to which it would be difficult to find a parallel in Western Christianity.

At the close of the last century there were only seven missionary societies in existence, properly so called. Of these three only, the Society for the Propagation of the Gospel in Foreign Parts, the Halle-Danish Society, and the Moravians, had been at work for the greater part of the century, while four, the Church Missionary Society, the Baptist Missionary Society, the London Missionary Society, and the Dutch Society at Rotterdam, began their work only in its tenth decade. To-day these seven have, in Europe and America alone, increased to upward of seventy, and to these must be added, not only several independent societies in the colonies, but numerous missionary associations on a smaller scale, the offspring of English and American societies.

MISSISSIPPI RIVER. The territory drained by the Mississippi river and its tributaries includes the greater part of the United States, lying between the Alleghany Mountains on the east and the Rocky Mountains on the west, and has an area (1,244,000 square miles) considerably larger than all central Europe. The central artery through which the drainage of this region passes is called the Mississippi river for about 1,300 miles above its mouth. The name is then usurped by a tributary, while the main stream becomes known as the Missouri. From its remote sources in the Rocky Mountains to the Gulf of Mexico the total length of the river is about 4,200 miles. The other principal tributaries are the Ohio, the Arkansas, and the Red river, but the Yazoo and the St. Francis often make dangerous contributions in seasons of flood.

Below the influx of the Ohio the Mississippi traverses

alluvial bottom lands liable to overflow in flood seasons. The soil is of inexhaustible fertility, producing large crops of corn in the northern portion, cotton in the middle district, and sugar, rice, and orange groves near the mouth. These bottom lands, averaging about forty miles in width, extend from north to south for a distance of 500 miles, having a general southern slope of eight inches to the mile. The river winds through them in a devious course for 1,100 miles, occasionally on the east side washing bluffs from 100 to 300 feet in height, but usually confined by banks of its own creation, which, as with all sediment-bearing rivers of like character, are highest near the stream itself. The general lateral slope toward the foot hills is about six inches in 5,000 feet, but the normal fall in the first mile is about seven feet. Thus apparently following a low ridge through the bottom lands, the tawny sea sweeps onward with great velocity, eroding its banks in the bends and rebuilding them on the points, now forming islands by its deposits, and now removing them as the direction of the flow is modified by the never-ending changes in progress. Chief among such changes is the formation of cut-offs. Two eroding bends gradually approach each other until the water forces a passage across the narrow neck. As the channel distance between these bends may be many miles, a cascade perhaps five or six feet in height is formed, and the torrent rushes through with a roar audible for miles. The banks dissolve like sugar. In a single day the course of the river is changed, and steamboats pass where a few hours before the plow had been at work. The checking of the current at the upper and lower mouths of the abandoned channel soon obstructs them by a deposit, and forms in a few years one of the characteristic crescent lakes which are so marked a feature on the maps.

The total area of the bottom lands is about 32,000 square miles, of which only a narrow strip along the immediate banks of the main river and of its principal bayous and tributaries has even yet been brought under cultivation. A proper system of protection against overflow would throw open 2,500,000 acres of rich sugar land, 7,000,000 acres of the best cotton land in the world, and 1,000,000 acres of corn land of unsurpassed fertility.

The work of embankment began in 1717, when the engineer De la Tour erected a dyke or levee one mile long to protect the infant city of New Orleans from overflow. Progress at first was slow. In 1770 the settlements extended only thirty miles above and twenty miles below New Orleans; but by 1828 the levees, although quite insufficient in dimensions, had become continuous nearly to the mouth of Red River. In 1850 a great impulse was given to systematic embankment by the United States Government, which gave over to the several States all unsold swamp and overflowed lands within their limits to provide a fund for reclaiming the districts liable to inundation. The action resulting from this caused alarm in Louisiana, for the great bottom lands above were believed to act as reservoirs to receive the highest flood wave; and it was imagined that if they were closed by levees the lower country would be overwhelmed whenever the river in flood rose above its natural banks. The aid of the government was invoked, and Congress immediately ordered the necessary investigations and surveys. This work was placed in charge of Captain (now General) Humphreys, and an elaborate report covering the results of ten years of investigation was published just after the outbreak of the civil war in 1861.

The percentage of sedimentary matter carried in suspension by the water varies greatly at different times, but is certainly not dependent upon the stage above low

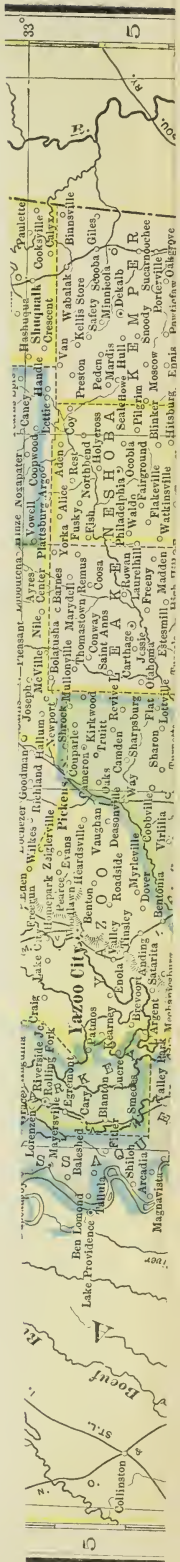
water. It is chiefly determined by the tributary whence the water proceeds, but is also influenced by the caving of the banks, which is always excessive when the river is rapidly falling after the spring flood. In long periods the sedimentary matter is to the water by weight nearly as 1 to 1,500, and by bulk as 1 to 2,900. The amount held in suspension and annually contributed to the Gulf constitutes a prism one mile square and 263 feet high. In addition to this amount a large volume, estimated at one mile square and twenty-seven feet high annually, is pushed by the current along the bottom and thus transported to the Gulf.

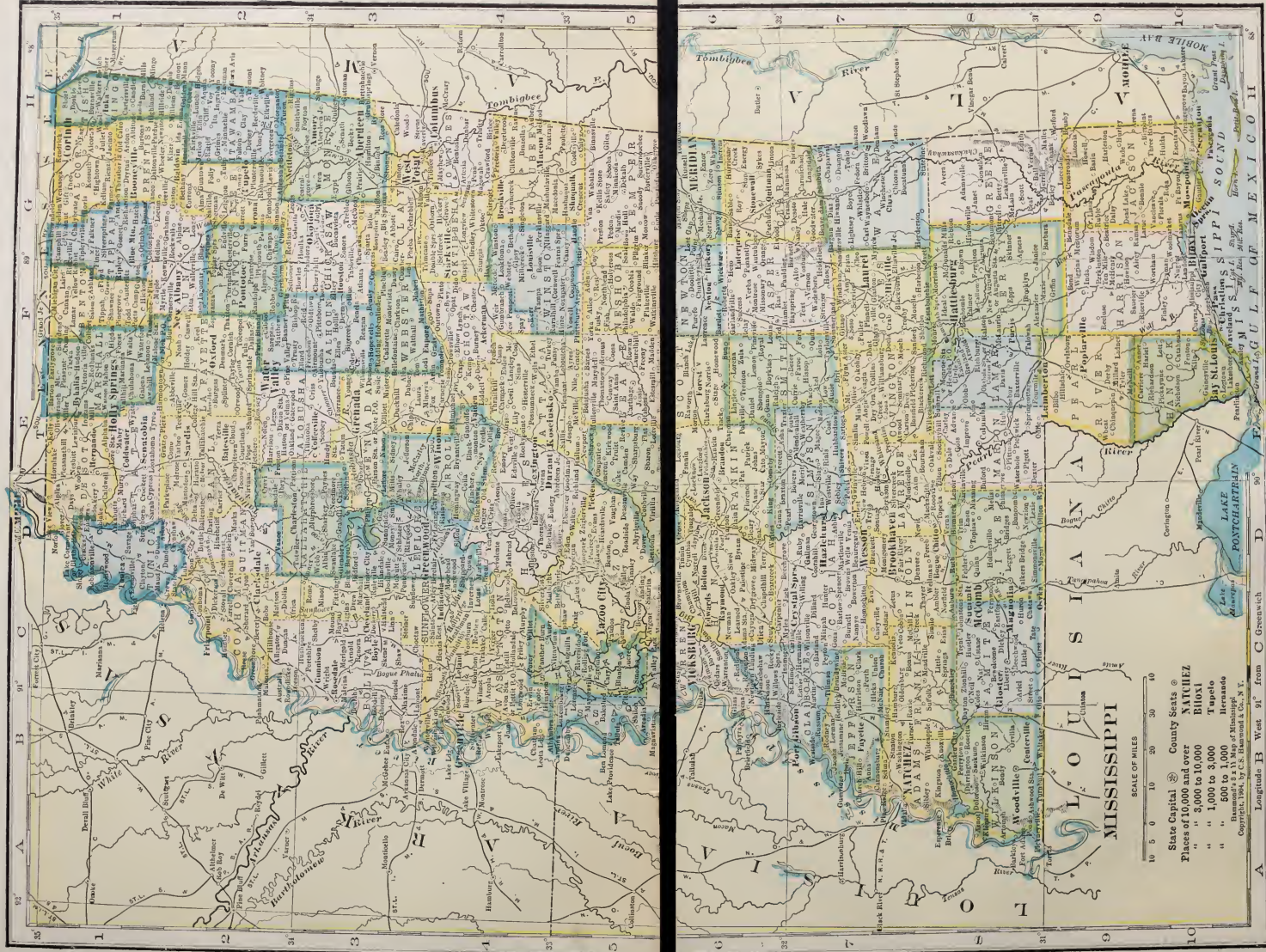
The mean annual succession of stages for long periods is quite uniform, but so many exceptions are noted that no definite prediction can safely be made for any particular epoch. The river is usually lowest in October. It rises rapidly until checked by the freezing of the northern tributaries. It begins to rise again in February, and attains its highest point about April 1st. After falling a few feet it again rises until, early in June, it attains nearly the same level as before. After this it rapidly recedes to low water mark. As a rule the river is above mid-stage from January to August inclusive, and below that level for the remainder of the year.

It has been established by measurement and observation that the great bottom lands above Red River before the construction of their levees did not serve as reservoirs to diminish the maximum wave which passed through Louisiana in great flood seasons. They had already become filled by local rains and by water escaping into them from the Mississippi through numerous bayous, so that at the date of highest water the discharge into the river near their southern borders was fully equal to the volume which the wave had lost in passing along their fronts.

In fine, the investigations between 1850 and 1860 established that no diversion of tributaries was possible; that no reservoirs artificially constructed could keep back the spring freshets, which caused the floods; that the making of cut-offs, which had sometimes been advocated as a measure of relief, so far from being beneficial, was in the highest degree injurious; that, while outlets within proper limits were theoretically advantageous, they were impracticable from the lack of suitable sites; and, finally, that levees properly constructed and judiciously placed would afford protection to the entire alluvial region.

During the civil war (1861-65) the artificial embankments were neglected; but after its close large sums were expended by the States directly interested in repairing them. The work was done without concert, upon defective plans, and a great flood early in 1874 inundated the country, causing terrible suffering and loss. Congress passed an act creating a commission of five engineers to determine and report on the best system for the permanent reclamation of the entire alluvial region. Their report, rendered in 1875, endorsed the conclusion of that of 1861, and advocated a general levee system on each bank. This system comprised—(1) a main embankment raised to specified heights sufficient to restrain the floods; and (2), where reasonable security against caving required considerable areas near the river to be thrown out, exterior levees of such a height as to exclude ordinary high waters but to allow free passage to great floods, which as a rule only occur at intervals of five or six years. The back country would thus be securely protected, and a safe refuge would be provided for the inhabitants and domestic animals living upon the portion subject to occasional overflow. An engineering organization was proposed for constructing and maintaining these levees, and a





detailed topographical survey was recommended to determine their precise location. Congress promptly approved and ordered the survey; but strong opposition on constitutional grounds was raised to the construction of the levees by the government.

In the meantime complaints began to be heard respecting the low-water navigation of the river below the mouth of the Ohio. Forty-three places above the mouth of Red River afforded depths of less than ten feet, and thirteen places depths less than five feet, the aggregate length of such places being about 150 miles. A board of five army engineers, appointed in 1878 to consider a plan of relief, reported that ten feet could probably be secured by narrowing the wide places to about 3,500 feet with hurdle work, brush ropes, or brush dykes designed to cause a deposit of sediment, and by protecting caving banks, when necessary, by such light and cheap mattresses as experience should show to be best suited to the work. Experiments in these methods were soon begun upon the river above Cairo, and have since proved of decided benefit.

In June, 1879, Congress created a commission of seven members to mature plans to correct, permanently determine, and deepen the channel, to protect the banks of the river, to improve and give safety to navigation, to prevent destructive floods, and to promote and facilitate commerce. Up to 1882 appropriations amounting to \$6,425,000 were made to execute the plans of this commission, but with provisos that none of the funds were to be expended in repairing or building levees for the protection of land against overflow, although such levees might be constructed if necessary to deepen the channel and improve navigation. Acting under this authority, the commission have allotted considerable sums to repair existing breaks in the levees; but their chief dependence is upon contracting the channel at low water by promoting lateral deposits, and upon protecting the high-water banks against caving by mats of brush, wire, etc., ballasted where necessary with stone—substantially the plans proposed by the army board of 1878.

The bars at the efflux of the passes at the mouth of the Mississippi have long been recognized as serious impediments to commerce. The river naturally discharges through three principal branches, the southwest pass, the south pass, and the northeast pass, the latter through two channels, the most northern of which is called Pass à l'Ouvre. The ruling depth on the several bars varies with the discharge over them, which in turn is controlled by the successive advances of the passes. In the natural condition the greatest depth does not exceed twelve or thirteen feet. The first appropriation by Congress to secure increased depth was made in 1837, and was expended in an elaborate survey and in a system of dredging by buckets, but the plan of a ship canal was also discussed. At the next appropriation, made in 1852, a board of officers, appointed by the war department, recommended trying in succession—(1) stirring up the bottom by suitable machinery, (2) dredging by buckets, (3) constructing parallel jetties five miles long at the southwest pass, to be extended as found necessary, (4) closing lateral outlets, and (5) constructing a ship canal. A depth of eighteen feet was secured by the first plan, and was maintained until the available funds were exhausted. Under the next appropriation (1856) an abortive attempt was made to apply the plan of jetties to the southwest pass. This failed from defects in execution by the contractors, but a depth of eighteen feet was finally secured by dredging and scraping. The report of 1861 discussed the subject of bar formation at length. Although it approved the plan of jetties and closure of outlets as correct in theory, the

stirring up of the bottom by scrapers during the flood stages of the river (six months annually) was recommended by it as the most economical and least objectionable. After the war this recommendation was carried into effect for several years with improved machinery, giving at a moderate annual cost a depth at times reaching twenty feet at extreme low water, but experience indicated that not much more than eighteen feet could be steadily maintained. This depth, entirely satisfactory at first, soon became insufficient to meet the growing demands of commerce, and in 1873, Major Howell, the engineer in charge, revived the project of a ship canal. The subject was discussed carefully by a board of army engineers, the majority approving a ship canal. In 1874 Congress constituted a special board which, after visiting Europe and examining similar works of improvement there, reported in favor of constructing jetties at the south pass, substantially upon the plan used by Mr. Caland at the mouth of the Meuse; and in March, 1875, Capt. J. B. Eads and associates were authorized by Congress to open by contract a broad and deep channel through the south pass upon the general plan proposed by this board. This contract called for "the maintenance of a channel of 30 feet in depth and 350 feet in width for twenty years" by "the construction of thoroughly substantial and permanent works by which said channel may be maintained for all time after their completion." The jetties were to be not less than 700 feet apart. The sum of \$5,400,000 was to be paid for obtaining this channel, and \$2,100,000 for maintaining it for twenty years. In addition, the contractors were authorized to use any materials on the public lands suitable for and needed in the work. The south pass was twelve and nine-tenths miles long. It had an average width of 730 feet and a minimum interior channel depth of 29 feet. The distance from the thirty-foot curve inside the pass across the bar to the thirty-foot curve outside was 11,900 feet. The minimum depth at average flood tide on the bar was about eight feet. The discharge at the mouth was about 57,000 cubic feet of water per second, transporting annually about 22,000,000 cubic yards of sediment in suspension to the Gulf. A small island and shoal existed at the head of the pass, the channel there having a minimum depth of seventeen feet. The work was begun on June 2, 1875, and has been so far successful that during the year ending June 30, 1882, a channel was maintained having a least depth of thirty feet between the jetties and extending through the bar. Its least width was twenty feet, the average being 105 feet. The twenty-six foot channel had a least width of 200 feet, except for a few days. In the pass itself the twenty-six foot channel had a least width of fifty feet. (See JETTIES, *ante*.)

MISSISSIPPI, one of the Southern States of the American Union, derives its name from the river which for more than 500 miles forms its western boundary between the 35th and 31st parallels of north latitude, separating it from Arkansas and Louisiana. The boundary with the latter State is continued along the 31st parallel, for 110 miles, to the Pearl river, and then down the Pearl to its mouth. The Gulf of Mexico, eastward from the mouth of Pearl river, completes the southern boundary. On the north the 35th parallel, from the Mississippi river to the Tennessee, separates the State from Tennessee, and the boundary then follows the latter river to the mouth of Bear creek. The eastern boundary of the State, separating it from Alabama, follows a line drawn from the mouth of Bear creek about seven degrees west of south to what was "the northwestern corner of Washington county on the Tombigbee," and thence due south to the Gulf of

Mexico. Ship, Horn, Cat, and Petit Bois Islands, and those nearer the shore, form a part of Mississippi. The extreme length of the State, north and south, is 330 miles, and its maximum breadth is 188 miles. Under the United States surveys, begun in 1803, the State has been divided into townships and sections, except such parts as were at the first owned by individuals. The area of the State is 46,340 square miles.

There are no mountains in Mississippi, but a considerable difference of level exists between the continuously low, flat, alluvial region lying along and between the Mississippi and Yazoo rivers, called "the Bottom," and nearly all the remainder of the State, which is classed as upland. The latter part, comprising five-sixths of the whole, is an undulating plateau whose general elevation above the water of the Gulf of Mexico increases to 150 feet within a few miles of the coast, and varies elsewhere from 150 to 500 or 600 feet. Some exceptional ridges are probably 800 feet high. The streams of this region flow in valleys varying in width from a few hundred yards to several miles. The fall of each river is not great, and is quite uniform. Usually a considerable part of the valley of each larger stream is several feet above its present high water mark, and forms the "hommock," or "second bottom" lands. On some of the rivers the lowest part of the valley, subject to overflow, is several miles in width, and bears a resemblance to the Mississippi Bottom.

Ridges or plateaus everywhere in the upland region divide the contiguous basins of creeks and rivers, descending more or less abruptly to their valleys. In the northeastern part of the State, almost level prairies cover large areas overlying a Cretaceous formation called Rotten Limestone.

A line of abrupt bluffs, extending southward from the northwest corner of the State, divides the upland region from the Bottom, where the general surface lies below the high-water level of the Mississippi river. A few long ridges, running north and south, and embracing about 200,000 acres, are barely above high water. The cultivated lands in the Bottom lie on these, and on the borders of the rivers and the numerous lakes and bayous, where the surface is slightly elevated. Low swamps or marshes, in which flourish large cypress trees, lie between the streams, and frequently receive the surface drainage from their banks. Large forest trees and dense cane-brakes occupy the drier ground. The Mississippi river is prevented from flooding the Bottom during high water by a system of levees or embankments built by a fund derived partly from taxation on the land and partly from the proceeds of the sale of public lands in the State classed as "swamp lands," which were given over for this purpose by Congress. The only compensation for the injury done when breaks in the levees ("crevasses") occur is the deposit of alluvial matter left by the overflow, which adds to the productiveness of the already wonderfully fertile soil. The present levee system usually protects about one-fourth of the 4,000,000 acres in the Bottom. Many crescent-shaped lakes ("cut-offs") occur in the Bottom. Similar phenomena present themselves in the channels of the other rivers having wide bottoms.

The volume of water in the streams varies greatly during the year, and is usually largest between the months of January and April. During high water all the larger streams are navigable by steamboats. These ply upon the Mississippi, Tennessee, and Yazoo rivers throughout the whole year. The rivers flowing into the Gulf are much obstructed by sand bars, and are chiefly used for floating logs to the saw-mills on the coast.

The best and only deep harbor on the coast is the well-protected roadstead inside of Ship Island. It has a depth of twenty-seven feet, a firm clay bottom, and is readily accessible to lighters from the shallower harbors along the coast.

Near the waters of the Gulf of Mexico the climate is much milder than in the northern parts of the State. On the southern borders the temperature rarely falls to 32° Fahr., or exceeds 95°, the annual mean being about 68°. The orange, lemon, almond, banana, and olive can be grown without protection. In the latitude of Vicksburg the temperature ranges from 98° to 20°, very rarely lower; the annual mean is 65°. The range in the northern part of the State is from 98° to 15°, or rarely 10°, and the annual mean is 61°. The first and last hoar-frosts occur, in the central parts of the State, usually in the latter parts of October and March. The ground is seldom frozen to the depth of three inches, and only for a few days at a time. The rainfall on the coast is sixty to sixty-five inches per annum, and at the northern boundary fifty inches. While about two-thirds of this precipitation occurs in winter and spring, a month seldom passes without several inches of rainfall.

Land and sea breezes in the south, and variable winds elsewhere, make the heat of summer tolerable. In healthfulness Mississippi compares favorably with other States. Where the surface is flat and poorly drained malarial fevers are prevalent during the warm season. Yellow fever has become epidemic after importation, but strict quarantine has been successful in preventing it.

The geological structure of the State is comparatively simple, and closely related to that of the adjacent States. The older formations are nearly all overlaid by deposits of the Quaternary period. In the extreme northeastern portion are found the oldest rocks in the State—an extension of the Subcarboniferous formation which underlies the Warrior coal-fields of Alabama. The strata here show some traces of the upheaval which formed the Appalachian mountain chain, whose southwest termination is found in Alabama. When this chain formed the Atlantic mountain-border of the continent, excepting this northeast corner, Mississippi had not emerged from the waters of the ancient Gulf of Mexico. As the shoreline of the Gulf slowly receded southward and westward, the sediment at its bottom gradually came to the surface, and constituted the Cretaceous and Tertiary formations of this and adjacent States.

Metallic ores are not found in Mississippi in paying quantities. The only valuable minerals are sandstones and limestones, marls, sands, lignite or brown coal, and fire-clays. None of these have been extensively brought into market. Potable water is found almost everywhere. Mississippi affords perhaps no species of fauna not found in the neighboring States. There are thirty or forty species of *Mammalia*, the most remarkable being the American opossum, still quite abundant. The deer (*Cervus virginianus*), black bear (*Ursus americanus*), wolves (*Canis lupus* and *Lupus americanus*), catamount (*Felis concolor*), and wild-cat (*Lynx rufus*) have much decreased in number, and may, like the buffalo and elk, shortly become extinct. About 150 species of birds are found during at least part of the year. Many are seen only *in transitu*, and about twenty species from the north spend the winter here. The mocking bird (*Mimus polyglottus*), the most remarkable songster, is very abundant. The wild turkey (*Meleagris gallipavo*) survives by virtue of its wary and watchful character. Over fifty species of *Reptilia* have been found, prominent among which is the alligator (*A. mississippiensis*), which attains a length of twelve or fifteen feet, and is common in the southern river bottoms. The rattlesnake, moccasin, and copper-

head, venomous serpents, are numerous. About half of the sixty-three species of fish abounding in the fresh and salt waters of the State are valuable for food. The edible oysters and crustaceans of the coast are remarkably fine.

Originally nearly the entire State was covered with a growth of forest trees of large size, mostly deciduous. The undergrowth was kept down by annual burnings by the natives, and the ground became carpeted with grasses and herbs. Over 120 species of forest trees are found; many valuable ones are abundant, and their timber constitutes a large item in the resources of the State.

Agriculture is the leading industry in Mississippi. Over 400,000 of the population are directly engaged in the cultivation of 5,895,000 acres of land. The character of the soil is varied, and all is productive, except that in the Flatwoods region and in the district covered with long-leaved pine, where only the valleys are fertile. At least half the State is exceptionally fertile. Not more than one-fourth of the arable land has been brought into cultivation, and two millions of acres of the best lands in the State, lying in the Bottom, might be made arable by proper drainage.

Cotton is the chief agricultural product. The crop of 1899 amounted to 1,313,798 bales, worth \$47,340,314. There were produced also of cotton seed 634,083 tons, worth \$6,692,027; of Indian corn, 38,789,920 bushels; of oats, 862,805 bushels; of wheat, 37,257 bushels; of rice, 739,222 pounds. Small quantities of rye, barley, molasses, and tobacco, and abundant crops of potatoes, yams, peas, and all garden vegetables, are annually produced.

Fruits of various kinds flourish in many parts of the State, and, with early vegetables, are largely shipped to the northern markets in spring and early summer. The value of the cotton crop is about three times as great as that of all the other products of the soil, which are sometimes insufficient for home consumption. Economically this specialization of agriculture is to be regretted; but successful efforts are being made to diversify it by growing other crops to which the soil and climate are equally well suited.

The principal articles manufactured are lumber, cotton and woollen goods, cotton-seed oil, and agricultural implements.

The number of inhabitants according to the different census returns from 1850 to 1900 is given in the following table:—

CENSUS.	Total.	White.	Colored.	Density per Sq. Mile.
1850	606,526	295,718	310,808	13.09
1860	791,314	353,910	437,404	17.07
1870	820,609	384,549	445,060	17.9
1900	1,551,270	641,200	910,070	33.5

Of the colored population, mostly freedmen and their descendants, 2,203 were Indians or half-breeds in 1900, and about 60,000 mulattoes. The whites own nearly all the farms and other real property. The total property valuation in the State decreased from \$607,324,911 in 1860 to \$209,197,345 in 1870, on account of the losses in war and the liberation of the slaves. There has been, however, a rapid increase in the last decade. The towns in the State have small populations; Vicksburg, 14,834 inhabitants; Natchez, 12,210, Meridian, 14,050, and Jackson, the State capital, 7,816. The population of the State in 1900 amounted to 1,289,600.

The three departments, legislative, executive, and judiciary, are similar to those of other States. The governor and other executive officers are elected for

four years. The legislature, which meets biennially, is composed of forty senators, serving four years, and 120 representatives, serving two years. These are apportioned to the seventy-four counties according to population, and elected by the people. The judiciary officers, consisting of three justices of the supreme court, twelve circuit judges, and twelve chancellors, are appointed by the governor with the consent of the senate. One attorney-general and twelve district attorneys are elected by the people. The state maintains a public school system, with separate schools for the two races, besides a State university and other schools of high grade for each of the races.

The nominal debt of the State is \$2,935,258, but if the amounts held by the Chickasaw and Common School funds are deducted the net debt (1900) was only \$1,018,430. The receipts of the State treasury were \$1,924,074 and the expenditures \$1,635,438. The taxable property as assessed was: Real estate, \$131,315,821; personal, \$57,400,338—total, \$215,765,947. The rate of State tax levy in 1900 was 6 mills.

Mississippi was first visited by Europeans in 1540, when the adventurous expedition of De Soto reached its northern parts. After the disastrous termination of this expedition no other Europeans visited this region until 1673, when Joliet and Père Marquette descended the Mississippi to latitude 33°. In 1682 La Salle and Tonty descended to the mouth of the river, and claimed the whole region drained by it for the king of France, giving it the name Louisiana. In 1699 the first colonists reached the coast of Mississippi, sent from France under Iberville. Settlements were made on Ship Island and Cat Island, and upon the mainland on the eastern side of Biloxi Bay, at Bay St Louis, and at Mobile. The colony did not prosper, and in 1712 Anthony Crozat obtained by charter from the king all the commercial privileges of the lower Mississippi valley. Under his management the colony languished, and in 1717 the king accepted the surrender of his charter, and granted another with more extended privileges to the "Western Company," or "Mississippi Scheme," with John Law as director-general, and Bienville as governor of the colony. Under this management the rich alluvial lands on the Mississippi river began to be occupied; tobacco, rice, and indigo were cultivated, and African slaves were introduced. Settlements were made near the present city of Natchez in 1720. Two years later, Law's company becoming bankrupt, much embarrassment in the colony followed, and troubles also began with the natives. On November 28, 1729, the Natchez Indians surprised and murdered about 200 of the white male residents, and made captives of about 500 women and children and negroes. A war followed, resulting in the destruction of the Natchez tribe. The representatives of the "Western Company" returned their franchises to the king in 1732, the number of colonists and slaves being then about 7,000. After two unsuccessful campaigns against the Chickasaw Indians in the northern part of what is now Mississippi, Bienville was superseded by the Marquis de Vaudreuil in 1740.

By the treaty of Paris, in 1763, France ceded all her possessions east of the Mississippi river to England, excepting the island of New Orleans, ceded to Spain. The British province of West Florida at first extended eastward from the Mississippi river along the Gulf coasts, with its northern limit at the thirty-first parallel of north latitude. Soon afterward the northern boundary was fixed at a line drawn eastward from the point where the Yazoo river unites with the Mississippi.

Under British rule the Natchez country, which had been deserted since the massacre of 1729, and the southern part of the present State of Mississippi, rapidly

filled with settlers, many of them emigrants from the Atlantic colonies. Cotton, indigo, and sugar were cultivated, and negro slaves continued to be freely introduced. During the revolutionary war of the Atlantic colonies, West Florida, being far removed, remained undisturbed until 1779. Spain and England being then at war, Galvez, the governor of New Orleans, aided by sympathizers with the revolutionary colonists, took possession of the whole of West Florida for the king of Spain. At the peace of 1783 England acknowledged the thirty-first parallel as the southern boundary of the United States, and ceded West Florida to Spain. The district between the thirty-first parallel and the parallel through the mouth of the Yazoo was therefore claimed by the United States and by Spain, the latter being in possession. After tedious negotiations the latter power relinquished the district in March, 1798, and Congress at once formed it into "the Mississippi Territory," which extended from the Mississippi river eastward between the two above-mentioned parallels of latitude to the Chattahoochee river.

The State of Georgia claimed as a part of its domain all of the district east of the Mississippi river, and between the 31st and 35th parallels. In 1802 it ceded its claims to the Federal Government for certain considerations, and in 1804 Congress extended the limits of the Mississippi Territory northward to the 35th parallel. Nearly all of the Territory was then owned by the native Indians. The Choctaws occupied the southern part, and the Chickasaws the northern part of what is now the State of Mississippi. In 1812 the United States troops occupied Spanish West Florida, and the district east of Pearl river and south of latitude 31° was added to the Mississippi Territory. The Territory was divided by the present line between Alabama and Mississippi, and the State of Mississippi admitted into the Union in 1817. In 1830-32 the native tribes exchanged their lands for others west of the Mississippi river and were nearly all removed, and a rapid influx of settlers followed. In January, 1861, the State seceded from the Federal Union, and, joining the Southern Confederacy, furnished a large number of troops during the civil war. It was the field of many important campaigns, and suffered great losses. Exhausted by the conflict, and harassed by processes of political reconstruction, the State was in a deplorable condition for several years. But within the last twenty years an era of prosperity commenced, marked by a large increase in population and great activity in agricultural and other pursuits.

MISSOLOGHI, or **MESOLONGHI**, a city of Greece, the chief town of the nomarchy of Acarnania and Etoia, situated on the north side of the Gulf of Patras, about seven miles from the coast, in the midst of a shallow lagoon, with a population of 6,324 in 1879, is notable for the siege of two months which Mavrocordatos with a handful of men sustained in 1821 against a Turkish army 11,000 strong, and for the more famous defense of 1825-26. Byron died there in 1824, and is commemorated by a cenotaph.

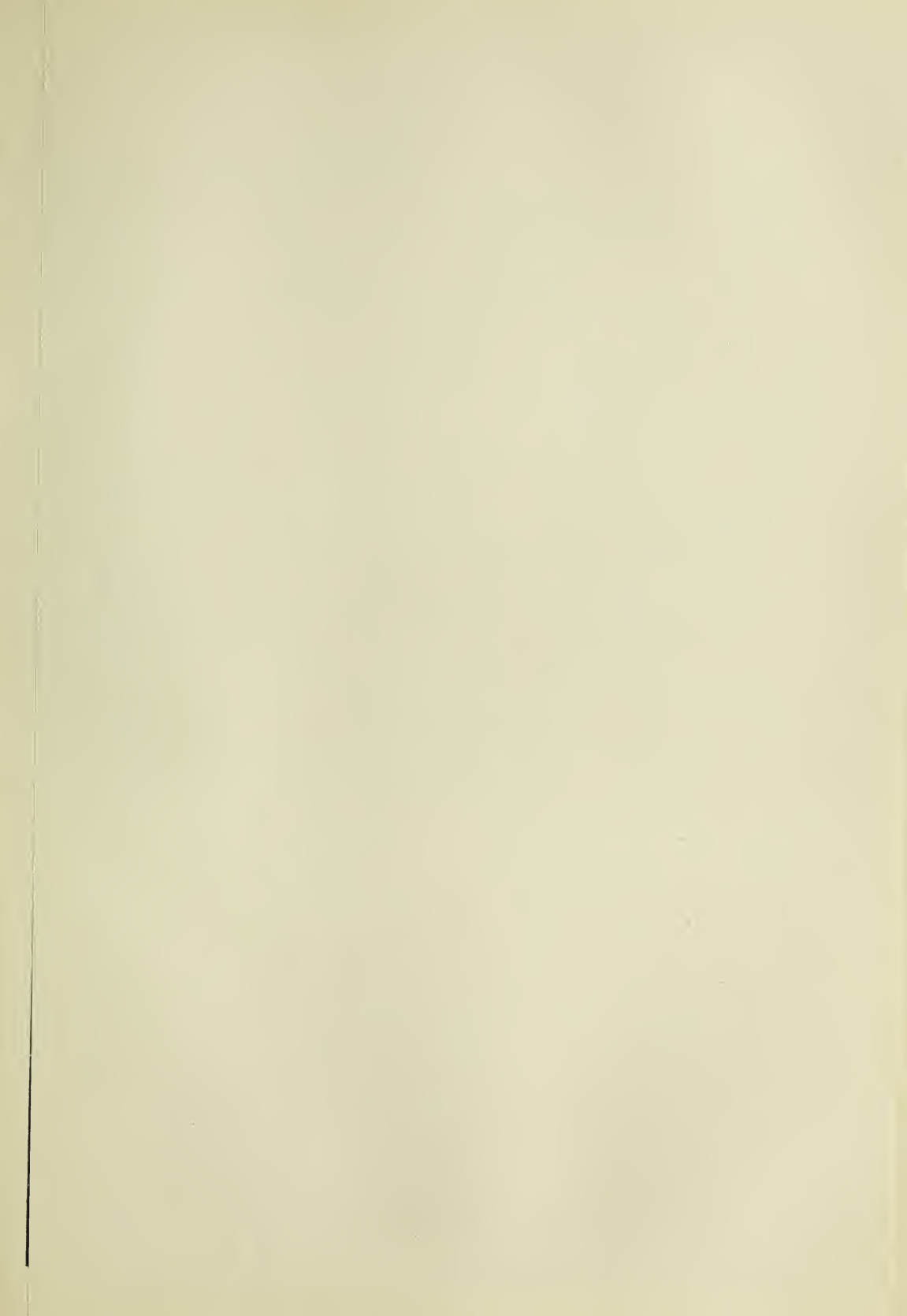
MISSOURI, a central State of the American Union, lying almost midway between the Atlantic and the Rocky Mountains, British America, and the Gulf of Mexico. Its eastern boundary is the Mississippi, separating it from Illinois, Kentucky, and Tennessee. North and south its boundaries with Iowa and Arkansas respectively are mainly coincident with the parallels of $40^{\circ} 30'$ and $36^{\circ} 30'$ N. latitude; but a small peninsula between the Mississippi and St. François rivers stretches thirty-four miles farther south between Arkansas and Tennessee. The western border, with Nebraska, Kansas, and the Indian Territory, is nearly

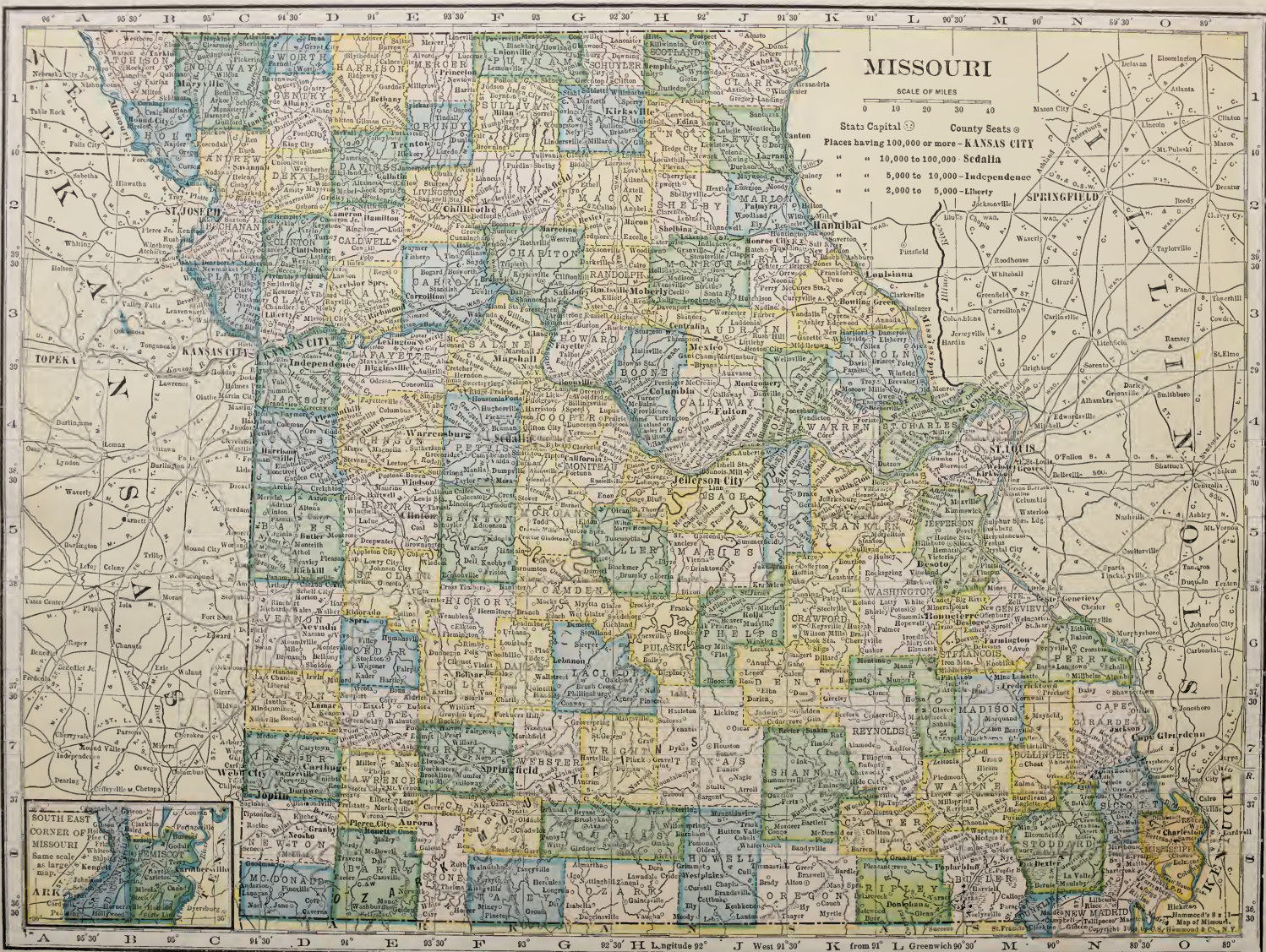
coincident with the course of the Missouri to the junction of that stream with the Kansas, and then follows the meridian of $17^{\circ} 40'$ W. of Washington. The area of the State is 68,375 square miles, the extreme length from north to south 282 miles, the extreme width 348 miles. Missouri is divided into a northern and southern portion by the Missouri river, flowing 400 miles in a generally easterly direction from its junction with the Kansas to the point twelve miles above St. Louis where it unites with the Mississippi. Northern Missouri has a surface broken and hilly, but not mountainous. It is mainly prairie land, well watered by streams, and fit for agriculture; but there is a good deal of timber in the eastern parts, especially along the bold bluffs of the two great rivers. Southern Missouri is almost equally divided between timber land in the east and prairie in the west. In its southwestern portion rises the table-land of the Ozark hills (highest point 1,600 feet above the sea). The Osage, the Gasconade, and other streams flow northward and eastward into the Missouri. The southeastern lowlands form an undulating country, readily drained after rain, with fertile ridges generally running north and south, occasional abrupt isolated hills, forests of oak, hickory, elm, maple, ash, locust, willow, persimmon, pecan, chestnut, and cherry trees, and in the lowest parts swamps and morasses.

The climate of Missouri, lying, as it does, far from the ocean and unprotected by mountain ranges, is one of extremes in heat and cold, moisture and drought. The Ozark range is high enough to influence the climate locally, but not to affect that of the whole State. The mean summer temperature ranges from 75° in the northwest of the State to 78.5° in the southeast; but the thermometer has been known to rise to 104° . The winter temperature averages 33.87° for the whole State, varying from 28.5° in the northwest to 39.5° in the southeast. In some winters the temperature hardly falls to zero; in others 20° below zero have been registered. The Mississippi at St. Louis freezes over once in four or five years; but this is partly caused by the accumulations of floating ice coming down from the north. The river has closed as early as the first week in December, and, again, has remained open until the last week in February. It is in cold seasons sometimes passable for the heaviest teams. The Missouri river is often closed during the whole winter. The mean annual temperature of the State varies from 53° to 58° . The climate is, on the whole, dry; for, in spite of the abundant rains, especially in the spring, evaporation is so rapid that the atmosphere is rarely overloaded with moisture. April is the driest month. The greatest amount of rain falls in the southeastern part of the State. An unusual amount of fair weather, prevailing clearness of sky, general salubrity of soil and climate, are chief among the natural advantages of this great State.

The exposed coal in Missouri includes upper, middle, and lower measures. In the first are about four feet of coal, and the area of exposure is about 8,400 square miles. The middle coal measures contain about seven feet of coal, and cover an exposed area of about 2,000 square miles. The lower measures have five workable seams, varying from eighteen inches in thickness to four and a half feet, and also some thin seams of only a few inches. The Missouri coal mines are easily worked.

The iron ores are red hematite, red oxide, specular iron, brown hematite or limonite, and clay ironstone. Manganiferous and siliceous specular ores occur in the porphyries of the Archæan rocks and in the granites. The greatest exposure of specular iron yet discovered is Iron Mountain, the purest mass or body of iron ore known. Analysis shows it to contain from sixty-five to sixty-nine





per cent. of metallic iron. The ore of Shepherd Mountain is not so rich as that of Iron Mountain, but is uniform in character, free from sulphur and phosphoric acid, and on the whole superior to any other yet developed in Missouri. Pilot Knob ore gives fifty-three to sixty per cent. metallic iron, and has few deleterious substances. It is fine-grained, light bluish gray in color. The ore of the Scotia iron banks and Iron Ridge are much alike in appearance and character, being specular boulders imbedded in soft red hematite. In some of these boulders are cavities in which the ore has taken botryoidal form, and upon these peroxide of iron crystallizations are so formed that a gorgeous show of prismatic colors is presented. The above are the chief deposits of iron ores, but limonites are found mostly in the southern parts of the State. The counties of Ste. Genevieve, Madison, St. François, Cape Girardeau, Bollinger, Wayne, Stoddard, Washington, Reynolds, Shannon, Carter, and Ripley have the greatest exposures of these ores, although they are found in many others. The supply of iron ores, is, indeed, practically inexhaustible.

Second only to iron among the metals of Missouri is the vast deposit of lead found in the southern parts of the State. The great disseminated lead region occupies about one-half of the northern portion of Madison, and about as much of St. François county. It is in the magnesian limestone that the largest quantities have been found. In Franklin county galena is found in abundance in ferruginous clay and coarse gravel. In the great mammoth mine in Washington county is a succession of caves in which millions of pounds of lead were found adhering to the sides and roofs. The central lead district of the State comprises the counties of Cole, Cooper, Moniteau, Morgan, Miller, Benton, Maries, Camden, and Osage; the southern lead region the counties of Pulaski, Laclede, Texas, Wright, Webster, Douglas, Ozark, and Christian. The western lead district includes the counties of Hickory, Dallas, Polk, St. Clair, Cedar, and Dade; the southwestern the counties of Jasper, Newton, Lawrence, Stone, Barry, and McDonald. The two counties, Jasper and Newton, produce fully one-half of the pig lead of Missouri. The lead mines of Granby are among the best known in the State, and millions of pounds of lead have been taken from these lands.

Copper deposits have been found in several counties, chiefly in the southwestern part of the State. Zinc is found, in the shape of sulphuret and also silicate of zinc, in nearly all the lead mines in southwestern Missouri. It has often occurred in such masses as seriously to hinder mining operations, and until very recent years, when railroad facilities have given this ore a market, it was thrown aside as worthless. It is now an important and profitable adjunct of the lead mines of Missouri. Cobalt and nickel are found at Mine La Motte and in a few other places. Silver is found in small quantities in lead mines in Madison county, combined with the lead.

Clays for the manufacture of ordinary brick for building purposes and for fire-brick exist in quantities beyond computation, and kaolin has been found in a few places. Marble of various shades and qualities abounds in Missouri, and is an important item in its mineral wealth. Limestones and sandstones suitable for building purposes are found in many parts of the State.

Indian corn, wheat, oats, and tobacco are the staple products; but cotton, hemp, and flax are also raised to some extent in the southern counties. The average yield of wheat to the acre is thirty bushels, and that return is often exceeded. No flour is of a higher quality or more in demand in foreign as well as home markets than that made from Missouri wheat. Indian

corn is especially used in fattening live stock. Blue grass, timothy, red-top, and red and white clover grow luxuriantly, and favor stock-raising. In some parts of the State pasturage can be had all the year round, and the cheapness of corn makes the raising of pork, in particular, a very profitable business. All varieties of fruit can be very successfully cultivated. The more tender fruits, such as apricots, nectarines, figs, and many choice kinds of grapes, grow here as well as the more northern fruits—the apple, the pear, the plum, and the cherry. Apples and peaches do well in all parts of the State. Six native varieties of grapes are found in luxuriant growth, and many cultivated varieties have been successfully introduced. No State, not even California, can hope ultimately to rival Missouri in the production of both red and white wines. Sheep-raising has proved remunerative in the southern counties chiefly, where the mild climate, the fine grasses, and the abundance of good water are especially favorable to this branch of agricultural industry.

Missouri is the second State in the Union in the number of its farms, being credited in 1900 with 284,886. It stands fourth in the number of acres of improved land, having 22,900,043 acres under cultivation. The value of Missouri farms, including land, fences, and buildings, reached the sum of \$843,979,213 in 1900. The value of its live stock is given in the United States census returns as \$160,540,004. The estimated value of all its farm productions, sold, consumed, or on hand, for the year 1900, was officially declared to be \$219,206,970.

In 1900 there were on the farms in the State 967,937 horses, 292,296 mules and asses, 765,386 dairy cows, 2,213,203 other neat cattle, 1,087,213 sheep and lambs, and 4,524,664 swine. The cattle, sheep, and hogs were valued in 1900 at \$95,541,588. Missouri supplies more wine than any State except California, and is a rival of Kentucky, Virginia, Tennessee and Maryland in the culture of tobacco, which is a staple in the rich counties in the northern central part of the State, bordering upon the Missouri river. The United States department of Agriculture furnished the following returns for 1899:

CROPS.	BUSHEL.	ACRES.	VALUE.
Corn.....	208,844,870	7,423,683	\$61,246,305
Wheat	23,072,768	2,056,219	13,520,012
Oats	20,545,350	916,178	4,669,185
Barley	28,969	1,727	11,232
Rye	220,338	21,233	103,192
Buckwheat	21,450	2,715	12,079
Flaxseed	611,888	100,952	519,929
Potatoes	7,786,623	93,915	2,756,695
Cotton (bales)	25,576	45,596	849,199
Tobacco (pounds)	3,041,996	4,361	218,991
Hay and forage (tons)	4,326,896	3,481,566	20,467,501

Red deer are found in every part of the State, especially in the thinly-settled and mountainous districts. Venison, indeed, in its season, is as cheap as good beef in the markets of St. Louis. Wild turkeys are numerous in the swampy and mountainous districts, and are found in all parts of the State. Prairie chickens, or pinnated grouse, are found in the prairie portion of Missouri, and are shipped in great numbers to Eastern markets. In all parts of Missouri are found the quail or Virginia partridge, thousands of barrels of which are shipped from the State each season. The rabbit, a species of hare, is so common as to be considered a pest. The gray squirrel and the red fox-squirrel are also found in large numbers all over the State. Black bass, perch, catfish, buffalo fish, suckers, and pike are the leading varieties of native fish.

In 1900 Missouri had about 18,760 manufacturing establishments, in which a capital of about \$250,000,000 was employed. The products of these establishments were valued at upward of \$385,000,000. The leading manufacturing counties outside of the city of St. Louis are Jackson, Buchanan, St. Charles, Marion, Franklin, Greene, Cape Girardeau, Platte, Boone, and Lafayette; but more than three-fourths of the manufactures are produced at St. Louis. The chief manufacture is that of flour, which employs about 900 mills, and is rapidly increasing. The iron industry, which stands second in importance, is yet only in its infancy, and St. Louis seems to be destined to be one of the great centers of iron and steel manufacture.

The extensive commerce of Missouri centers at St. Louis, between which city and the ports on the Mississippi and Missouri rivers steamboats are constantly plying. Railroad transportation has, in recent years, furnished superior and cheaper facilities for much of the trade which formerly depended upon the rivers. The trade in cotton especially has been greatly increased in Missouri since 1870 by the use of railroad transportation, which has made St. Louis one of the great cotton centers of the United States. Extensive cotton presses were built in St. Louis in that year, and the receipts of cotton from the more southern States have increased rapidly. Railroad connections have made the interior portions of Arkansas and Texas more accessible to St. Louis than to the southern ports of shipment, and the trade with the southwest, with the Indians, and with Mexico is constantly increasing. In 1870, St. Louis was made by act of Congress a port of entry to which foreign merchandise could be brought in bond.

Missouri is divided into 114 counties. The following table gives the number of inhabitants from 1870 to 1900:

Year.	Males.	Females.	Total.	Density per sq. mile.
1870	896,347	824,948	1,721,295	26.34
1880	1,127,187	1,041,193	2,168,380	31.55
1890	1,385,239	1,293,946	2,679,184	39.0
1900	1,595,710	1,510,955	3,106,665	45.2

The census of 1900 gives the population as 3,106,665. The early settlers of the State were French, and their descendants are still found in St. Louis and Ste. Genevieve and a few other smaller towns. Many Germans have recently settled in all parts of the State, while English, Irish, Scotch, and Swedes have also made Missouri their home in considerable numbers. The native American population is mostly descended from immigrants from the States of Kentucky, Tennessee, North Carolina, and Virginia. During recent years there has been a large accession to the population from the eastern and northwestern States.

St. Louis, the chief city of the Mississippi valley, situated upon the Mississippi river about twelve miles below the mouth of the Missouri, had in 1900 a population of 575,238; Kansas City, 163,752; St. Joseph, 102,979; Hannibal, 12,780; Joplin, 26,023, and Jefferson City (the State capital), 9,664.

Missouri has a public school system of education first adopted in 1839. There are district schools, elementary and ungraded; city schools, graded, with high school courses; four normal schools, and a State university. Free public schools for white and colored children between the ages of six and twenty years are required by law for every district in the State. Besides these public institutions supported by the State there are many private schools and colleges for both sexes. Chief among these are the St. Louis University, an institution

managed by the Jesuits; the College of Christian Brothers, also under the control of the Roman Catholics; and Washington University, a non-sectarian endowed school, which has property estimated at \$1,000,000, and more than 1,300 students. The Baptists have a college at Liberty called William Jewell College; the Congregationalists one at Springfield called Drury College; and the Methodists and Presbyterians several colleges and seminaries.

The receipts for school purposes in the year ending July 1, 1899, were \$6,734,315, which included \$1,110,419 brought over from the previous year. The expenditures for all purposes were \$7,048,826, of which \$4,663,209 was for teachers' and superintendents' salaries. The permanent school fund was made up as follows:

Certificates of indebtedness at 6 per cent.....	\$2,909,000 00	
Certificates of indebtedness at 5 per cent.....	225,000 00	
In treasury to credit of State School fund.....	2,206 74	
Total amount to credit of the "State School fund".....		\$3,136,206 74
University or "Seminary fund".....		535,000 00
County Public School fund.....		3,529,300 13
Township Public School fund.....		2,113,409 36
Special Public School fund.....		1,417,328 38
Total.....		\$12,447,242.61

The number of white children enrolled was 668,018 and of colored children 33,215, and there was an average daily attendance of 416,364. There were 10,326 schools, with school property valued at \$17,020,880.

The legislative power is vested in a body consisting of a senate and a house of representatives, which meets once in every two years, on the Wednesday after the first day of January next after the election of the members thereof. Members of the legislature are paid a sum not to exceed \$5 a day for the first seventy days of the session, and after that not to exceed \$1 a day for the remainder of the session. They are also allowed mileage. The executive department consists of a governor, a lieutenant-governor, a secretary of state, a state auditor, state treasurer, an attorney-general, and a superintendent of public instruction; these are all elected by the people. The supreme executive power is vested in the governor, who is chosen for four years, as also are the other members of this department. The governor has a qualified veto upon the acts of the legislature, and such other powers as are common to that officer in the several States. Executive and judicial officers are liable to impeachment by the house of representatives.

The report of the State Treasurer for 1900 shows as follows:

Total actual receipts from all sources during the year 1900..	\$3,393,513 99
Transfers into different funds during the year 1900.....	1,251,290 62
Receipts during the year 1900, including transfers.....	4,644,804 61
Total.....	\$6,154,266 61
Total actual disbursements during the year 1900.....	\$3,110,031 93
Transfers from different funds during the year 1900.....	1,251,290 62
Disbursements during the year 1900, including transfers.....	6,003,276 06
Balance in the treasury at close of business December 31, 1900.....	\$1,078,932 06

The interest-bearing debt of the State on January 1, 1901, was as follows:

Bonded debt of the State (a reduction during the preceding two years of an amount totalling \$1,755,000....)	\$ 1,887,000
Bonded debt (1900) of the cities and towns.....	26,055,192
State certificates of indebtedness (1901).....	3,158,000

The total bonded debt in 1900 was only \$1,887,000. The assessed valuation (real and personal) for 1901 was \$1,093,091,264; and the assessed valuation of St. Louis property in the same year was \$355,306,387.

On April 9, 1682, the French voyager and discoverer La Salle took possession of the country of Louisiana in the name of the king of France. Its limits were quite indefinite, and included the present territory of Missouri (see LOUISIANA). The first settlements of Missouri were made in Ste. Genevieve and at New Bourbon, but uncertainty exists as to the exact date. By some the year is fixed at 1763; by others, and by many traditions, as early as 1735. St. Louis was settled by Pierre Laclede Ligest, a native of France. The site was chosen in 1763, and in February, 1764, Auguste Chouteau went at the order of Ligest to the spot previously selected, and built a small village. For a long time the settlements were confined to the neighborhood of the river. On October 31, 1803, the Congress of the United States passed an act by which the president was authorized to take possession of the territory according to the treaty of Paris, and the formal transfer of Lower Louisiana was made on December 20, 1803. In 1804 Congress divided the territory into two portions. The northern part, commonly called Upper Louisiana, was taken possession of in March, 1804. In June, 1812, Missouri was organized as a Territory, with a governor and general assembly. The first governor (1813-1820) was William Clarke. In 1818 Missouri applied for admission to the Union as a State. Two years of bitter controversy followed, which convulsed the country and threatened the dissolution of the Union. This controversy followed a resolution introduced into Congress which had in view an anti-slavery restriction upon the admission of Missouri to the Union. This was at last settled by the adoption of the "Missouri compromise," which forbade slavery in all that portion of the Louisiana purchase lying north of 36° 30' except in Missouri, and on July 19, 1820, Missouri was admitted to the Union. A convention to frame a constitution had already been called, and the constitution then adopted remained without material change until 1865. The first general assembly under the constitution met in St. Louis in September, 1820, and Alexander McNair was chosen governor in August. The seat of government was fixed at St. Charles in 1820, and removed to Jefferson City, the present State capital, in 1826. The first census of the State was taken in 1821, when the number of inhabitants was found to be 70,647, of whom 11,254 were slaves. In the Black Hawk war in 1832, the Florida war in 1837, and the Mexican war in 1846 Missouri volunteer troops did their share of the work. In the troubles in Kansas, and the bitter discussion upon the question of slavery, Missouri was deeply involved. A strong feeling in favor of secession showed itself in many parts of the State. Governor Jackson, in his inaugural address on January 4, 1861, said that Missouri must stand by the slaveholding States, whatever might be their course. The election of a majority of Union men, however, as delegates to a convention called to consider the affairs of the nation, showed that

public sentiment was hostile to secession, and the convention adjourned without committing the State to the secession party. United States troops were soon gathered at St. Louis, and forces were also sent to Jefferson City, and to Rolla. Governor Jackson fled from the capital, and summoned all the State troops to meet him at Booneville. General Lyon defeated these troops on June 17, 1861, and soon most of the State was under the control of the United States forces. The State convention was reassembled. This body declared vacant the offices of governor, lieutenant-governor, and secretary of state, and filled them by appointment. The seats of the members of the legislature were also declared vacant. Governor Jackson soon issued a proclamation declaring the State out of the Union, and Confederate forces were assembled in large numbers in the southwestern part of the State. General Lyon was killed at the battle of Wilson's Creek near Springfield, and General Fremont, commanding the department of the west, decreed martial law throughout the State. For a year matters were favorable to the confederates, and at the opening of 1862 their troops held nearly half the State; but in February a Federal force under General Curtis drove General Price into Arkansas. He returned in 1864, and overran a large part of the State, but was finally forced to retreat, and but little further trouble arose in Missouri during the war. Missouri furnished to the United States army during the war 108,773 troops. In 1865 a new constitution was adopted by the people. In 1869 the XVth Amendment to the United States constitution was adopted by a large majority. In 1875 still another State constitution was drawn up by a convention called for that purpose, and ratified by the people, and is now the fundamental law of the State.

MISTLETOE (*Viscum album*, L.), a species of *Viscum*, of the family *Loranthaceae*. The whole genus is parasitical, and seventy-six species have been described; but only the mistletoe proper is a native of Europe. It forms an evergreen bush, about four feet in length, thickly crowded with (falsely) dichotomous branches and opposite leaves. The leaves are about two inches long, obovate-lanceolate, yellowish green; the dioecious flowers, which are small and nearly of the same color but yellower, appear in February and March; the fruit, which when ripe is filled with a viscous semi-transparent pulp (whence birdlime is derived), is almost always white, but there is said to be a variety with red fruit. The mistletoe is parasitic on both deciduous and evergreen trees and shrubs. In England it is most abundant on the apple tree, but rarely found on the oak. The fruit is eaten by most frugivorous birds, and through their agency, particularly that of the thrush (hence missel-thrush or mistle-thrush), the plant is propagated. The sowing is effected by the bird wiping its beak, to which the seeds adhere, against the bark of the tree on which it has alighted. The growth of the plant is slow, and its durability proportionately great, its death being determined generally by that of the tree on which it has established itself. The mistletoe so extensively used in England at Christmas tide is largely derived from the apple orchards of Normandy.

MITAU, a town of Russia, capital of the government of Courland. It is situated twenty-seven miles by rail to the southwest of Riga, on the right bank of the river Aa, in a fertile plain which rises only twelve feet above sea-level. Mitau has 22,200 inhabitants, mainly Germans, but including also Jews (about 6,000), Letts (5,000), and Russians.

MITCHEL, ORMSBY M'KNIGHT, American general and writer on astronomy, was born in Union county, Ky., August 28, 1810. He began life as a clerk, but, obtaining an appointment to a cadetship at West

Point in 1825, he graduated there in 1829, and became assistant professor of mathematics in 1831. From 1859 to 1861 he was director of the Dudley observatory at Albany. He died of yellow fever at Beaufort, S. C., October 30, 1862.

MITCHELL, SIR THOMAS LIVINGSTONE, Australian explorer, was a son of Mitchell of Craighend, Stirlingshire, Scotland, where he was born, June 16, 1792. He died at his residence at Darling Point, Sydney, October 5, 1855.

MITE. Mites (*Acarina*) are minute creatures which form a large division of the *Arachnida*, distinguished by the absence of any constriction between the cephalothorax and abdomen. Linnæus included all in the single genus *Acarus*. They are now divided into several families. Mites are distributed all over the known world. They have been found in Franz-Josef's Land and Spitzbergen and in the hottest tropical regions, as well as the temperate zones. Often very similar species come from all parts. They are numerous in amber of the Tertiary epoch. The best-known species are probably those which injure man or his works, viz., the itch mite, the cheese mite, the so-called harvest-bug, and the red spider. The dog-tick is also well known.

The itch mite (*Sarcoptes scabiei*), is a minute, almost circular, flattened, colorless creature, with skin covered with wavy wrinkles, and a number of triangular points arising from that of the back; legs short, the two front pairs and the fourth pair in the male terminated by suckers on long stalks, the two hind pairs in the female and third pair in the male having long bristles instead. It is parasitic on human beings; the males and young remain chiefly on the surface of the skin, but are difficult to find; the female burrows under the scarf-skin, causing the intense itching of scabies by the action of her chelate mandibles as she eats her way. A small watery pustule is raised near where the acarus has entered the skin, and others arise; the creature is not found in the pustule, but at the further end of a short tunnel which may be half an inch long. The eggs are laid in the tunnel after the acarus has passed; they hatch and multiply rapidly. The disease can be certainly cured; the usual mode is to rub the whole body with sulphur ointment, which is best done after a warm bath, allow it to remain on all night, and wash off in the morning. This treatment should be repeated once or twice at intervals of a day or two. Other applications of sulphur, as sulphurous acid, sulphur vapor baths, etc., are efficacious. All clothes which have touched the skin must be disinfected by heat. The disease is highly contagious. Most mammals have their peculiar varieties of itch mite.

MITFORD, MARY RUSSELL, born at Alresford, Hampshire, England, December 16, 1786, retains an honorable place in English literature as the authoress of *Our Village*, a series of sketches of village scenes and characters unsurpassed in their kind, and, after half a century of imitations, as fresh as if they had been written yesterday. She died January 10, 1855.

MITHRADATES, or, as it is often wrongly spelled, MITHRIDATES (*i.e.*, "given by the god Mithras,") was a favorite name of the Pontic kings in the third and second centuries B.C., and was also common in Persia and the neighboring countries. The most famous of the name was Mithradates Eupator, sixth of the name, one of those remarkable conquerors that arise from time to time in the East. For twenty-four years he withstood the power of Rome, but was finally induced to suicide on account of a revolt of his troops, which left him exposed to the Roman power.

MITHRAS was a Persian god, whose worship spread over the Roman world during the second and third cent-

uries after Christ. His name is found in the oldest records of the East Aryan races.

MITRE. The head dress worn by bishops, abbots, and certain other prelates of the western church when attending solemn church service.

MITSCHERLICH, EILHARDT, was born January 7, 1794, at Neuende, near Jever, in the grand duchy of Oldenburg. In 1818 he went to Berlin, where he worked in the laboratory of Professor Link. He made analyses of phosphates and phosphites, arseniates and arsenites, confirming the observations of Berzelius as to their composition. In the course of these investigations he observed that corresponding phosphates and arseniates crystallized in the same form.

This was the germ from which grew the theory of isomorphism. The theory of isomorphism is the work of Mitscherlich. It was communicated to the Berlin Academy on December 9, 1819.

In pure chemistry Mitscherlich's discoveries were mainly connected with isomorphism. Thus he obtained selenic acid in 1827, and showed the isomorphism of its salts with the sulphates, and examined with great care the manganates and permanganates, showing their isomorphism with the sulphates, and with the perchlorates respectively. But he did much important work unconnected with this special subject.

In 1833 he published his *Lehrbuch der Chemie*, a student's text-book of chemistry of the most thoroughly practical and yet rigidly scientific kind, from the study of which teachers of chemistry may still derive many a valuable hint. In December, 1861, symptoms of heart disease made their appearance, but he was able to carry on his academical work till December, 1862. He died at Schöneberg, near Berlin, on August 28, 1863.

MITYLENE, or MYTILENE. See LESBOS.

MIZPAH (מִצְפָּה) and MIZPEH (מִצְפֶּה) are Hebrew

words for a "place of prospect," or high commanding point. The cities of Palestine generally occupied such positions; and so in the Old Testament we find several places bearing the name of "The Mizpah" (Mizpeh). Sometimes a determining genitive is added; "The Mizpeh of Gilead," "The Mizpeh of Moab."

MNEMONICS, or artificial helps to the memory, have been employed in a more or less systematic form from a very early period. Mnemonics were much cultivated by Greek sophists and philosophers, and are repeatedly referred to by Plato and Aristotle. In later times the invention was ascribed to the poet Simonides, perhaps for no other reason than that the strength of his memory was famous. Cicero, who attaches considerable importance to the art, but more to the principle of order as the best help to memory, speaks of Carneades (or perhaps Charmades), of Athens, and Metrodorus of Scepsis as distinguished examples of the use of well-ordered images to aid the memory. The latter is said by Pliny to have carried the art so far that he could repeat anything in the same words he had heard it. The Romans valued such helps as giving facility in public speaking. In his time the art had almost ceased to be practiced. The Greek and Roman system of mnemonics was founded on the use of mental places and signs or pictures. The thing to be remembered was localized in the imagination, and associated with a symbol which concretely represented what it was desired to retain in the memory, special care being taken that the symbols should be as vivid, pleasing, and impressive as possible. The most usual method was to choose a large house, of which the apartments, walls, windows, statues, furniture, etc., were severally associated with certain names, phrases, events, or ideas, by means of *symbolic*

pictures; and to recall these it was only necessary to search over the apartments of the house, till the particular place was discovered where they had been deposited by the imagination. As the things to be remembered increased, new houses could be built, each set apart to a certain class of ideas or events, and these houses were again constructed into a mnemonic town. In accordance with this system, if it were desired to fix an historic date in the memory, it was localized in an imaginary town divided into a certain number of districts, each with ten houses, each house with ten rooms, and each room with a hundred quadrates or memory-places, partly on the floor, partly on the four walls, partly on the roof. The success of the method depended largely on the power of the imagination to give the different houses, rooms, etc., characteristic varieties of aspect, and we may suppose that it was the effort to frame suitable images and places, giving an adventitious interest to dry details, that constituted the real advantage of the system.

MOA. See DINORNIS.

MOAB. Moab and Ammon (children of Lot) constitute along with Edom and Israel (children of Isaac) that group of four Hebrew peoples which in early antiquity had issued from the Syro-Arabian wilderness, and settled on the border of the cultivated country eastward of the great depression which extends from the Gulf of Elath to the Dead Sea, and up the valley of the Jordan. According to the book of Genesis, they had come out of Mesopotamia, and so were precursors of the larger wave which followed from the same quarter, forming the most southern outpost of the Aramæan immigration into the lands of Canaan and Heth. Whether the Hebrews were originally Aramæans is questionable, but it is certain that, like the Aramæans, they were distinct from the Canaanites, whose conquerors they were.

MO'ALLAKÁT. *Al-Mo'allakát* is the title of a group of seven long Arabic poems, which have come down to us from the time before Islam. The name signifies "the suspended" (pl.), the traditional explanation being that these poems were hung up by the Arabs on or in the Ka'ba at Mecca.

MOBERLY, a thriving town of Randolph county, Mo., twenty-three miles south of Macon, is eligibly situated at the junction of several railroads, and had attained in 1900 a population of 8,012. It has manufactories of carriages, flour, and tobacco, and some large railroad, machine, and car-shops. Moberly has several banks, three newspapers, and twelve churches.

MOBILE, a city and port of entry of the United States, the capital of Mobile county, and, though not the capital, the largest city of Alabama, lies 140 miles east of New Orleans, on a sandy plain on the west bank of Mobile river, one of the arms of the Alabama. The municipal boundary includes an area about six miles long by two or three in breadth; but, excluding the suburban villas scattered about the nearer hills, the portion occupied by the buildings of the city proper is not more than a mile square. In the matter of paving and shade the streets are generally good, and Government street especially, with its fine oak trees and gardens, forms an attractive promenade. Besides the spacious granite building erected in 1859 to accommodate the Custom-house, the Post-office, and the United States courts, the principal edifices are the Roman Catholic cathedral of the Immaculate Conception (1833), Christ Church (Episcopal) (1837), the City Hospital (1830), the United States Marine Hospital (1836), the Providence Infirmary, the conjoint market-house and municipal buildings, Barton Academy (occupied by the high schools), and the Alabama Medical College (founded in 1859). About six

miles out, at Spring Hill, is the Jesuit College of St. Joseph, established by Bishop Portier in 1832. As a commercial center Mobile is in some respects very favorably situated. It is the only port of Alabama; the estuary on which it stands is the outlet for several navigable rivers; and it is the seaward terminus of the Mobile and Ohio railroad, the Mobile and Montgomery, and the Grand Trunk. But, on the other hand, it lies twenty-five miles from the coast; the lagoon-like bay cut off from the Gulf of Mexico by the narrow isthmus of Mobile Point is extremely shallow; and in 1879 no vessel drawing more than thirteen feet could load and unload in the harbor with safety. Since 1827, it is true, various works have been undertaken to improve the approaches: the Choctaw Pass and the Dog River Bar, which had formerly a depth of little more than five and eight feet respectively, were deepened to seventeen feet by 1882. A private company, established in 1876, has built a breakwater in the bay, and greatly increased the safety of the harbor. Though in 1820 it had no more than 2,672 inhabitants, Mobile had 31,255 in 1880, 31,076 in 1890, and 38,469 in 1900.

Founded as a fort by Lemoyne d'Iberville (de Bienville) in 1702, Mobile continued to be the capital of the colony of Louisiana till 1723, when this rank was transferred to New Orleans. The site selected by Lemoyne was probably about twenty miles above the present position, which was first occupied after the floods of 1711. By the Treaty of Paris, 1763, Mobile and part of Louisiana were ceded to Britain; but in 1780 the fort (now Fort Charlotte) was captured by the Spanish general Galvez, and in 1783 it was recognized as Spanish along with other British possessions on the Gulf of Mexico. General Wilkinson, ex-governor of Louisiana, recovered the town for Louisiana in 1813, and in 1819, though its population did not exceed 2,500, it was incorporated as a city. In 1864-65 Mobile and the neighborhood was the scene of important military and naval engagements. The Confederates had surrounded the city by three lines of defensive works, but the defeat of their fleet by Admiral Farragut, and the capture of Fort Morgan, Spanish Fort, and Fort Blakely, led to its immediate evacuation. As a municipal corporation Mobile had got into such financial difficulties by 1879 that its city charter was repealed, and a board of commissioners established for the liquidation of its debt of \$2,497,856.

MÖBIUS, AUGUST FERDINAND, astronomer and mathematician, was born at Schulpforta, Germany, November 17, 1790, and died in 1868.

MOCHÁ, a town of Yemen on the coast of the Red Sea. Mochá itself is a modern town, which rose with the coffee trade into short-lived prosperity. The internal disorders of Arabia and the efforts of Mohammed Ali to make the coffee trade again pass through India accelerated its fall, and the place is now a mere village. Mochá never produced coffee, and lies indeed in a quite sterile plain; the European name of Mochá coffee is derived from the shipment of coffee there.

MOCKING-BIRD, or MOCK-BIRD, the *Mimus polyglottus* of modern ornithologists, and the well-known representative of an American group of birds usually placed among the THRUSHES (*q.v.*), *Turdidae*, though often regarded as forming a distinct section of that family, differing by having the tarsus scutellate in front, while the typical thrushes have it covered by a single horny plate. The Mocking-bird inhabits the greater part of the United States, being in the north only a summer visitant; but, though breeding yearly in New England, is not common there, and migrates to the south in winter, passing that season in the Gulf States and Mexico. It appears to be less numerous on the

western side of the Alleghanies, though found in suitable localities across the continent to the Pacific coast, but not farther northward than Wisconsin, and is common in Kansas. The names of the species, both English and scientific, have been bestowed from its capacity of successfully imitating the cry of many other birds, to say nothing of other sounds, in addition to uttering notes of its own which possess a varied range and liquid fullness of tone that are unequaled, according to its admirers, even by those of the NIGHTINGALE, (*q.v.*) Plain in plumage, being grayish-brown above and dull white below, while its quills are dingy black, variegated with white, there is little about the Mocking-bird's appearance beyond its graceful form to recommend it; but the lively gesticulations it exhibits are very attractive, and therein its European rival in melody is far surpassed, for the cock-bird mounts aloft in rapid circling flight, and, alighting on a conspicuous perch, pours forth his ever-changing song to the delight of all listeners; while his actions in attendance on his mate are playfully demonstrative and equally interest the observer. The Mocking-bird is moreover of familiar habits, haunting the neighborhood of houses, and is therefore a general favorite. The nest is placed with little regard to concealment, and is not distinguished by much care in its construction. The eggs, from three to six in number, are of a pale bluish-green, blotched and spotted with light yellowish-brown. They, as well as the young, are much sought after by snakes, but the parents are often successful in repelling these deadly enemies, and are always ready to wage war against any intruder on their precincts, be it man, cat, or hawk. Their food is various, consisting of berries, seeds, and insects.

MODENA, one of the principal cities of Northern Italy, formerly the capital of a duchy, and still the chief town of a province and the seat of an archbishop, is situated in the open country in the south side of the valley of the Po, between the Secchia to the west and the Panaro to the east. By rail it is thirty-one miles east-southeast of Parma, twenty-four west-northwest of Bologna, and thirty-seven south of Mantua.

The university of Modena, originally founded in 1683 by Francis II., is mainly a medical and legal school, but has also a faculty of physical and mathematical science. It has about 45 professors, and from 600 to 700 students; a library of 25,000 volumes, an observatory, botanical gardens, an ethnographical museum, etc. The old academy of the *Dissonanti*, dating from 1684, was restored by Francis in 1814, and now forms the flourishing Royal Academy of Science and Art; and there are besides, in the city, an Italian Society of Science, founded by Anton Mario Lorgna, an academy of fine arts, a military college (1859), an important agricultural college, and a lyceum and gymnasium, both named after Muratori. In industrial enterprise the Modenese show but little activity, silk and linen goods and iron-ware being almost the only products of any note. Commerce is stimulated by a good position in the railway system, and by a canal which opens a water-way by the Panaro and the Po to the Adriatic. The population of the city was 32,248 in 1861, and 30,854 in 1871; that of the commune, 55,512 in 1861, and 64,941 in 1901.

THE DUCHY OF MODENA, an independent sovereign state (1452 to 1859), ultimately extended from the Po to the Mediterranean, and was bounded north by Lombardy and the Papal States, east by the Papal States and Tuscany, south by Tuscany, Sardinia, and the Mediterranean, and west by Sardinia and the duchy of Parma. Its greatest length, from Porto-Vecchio, on its northern frontier toward Mantua, to the outlet of the Parmignola torrent, on the Sardinian frontier, was eighty-four and one-half miles; and its greatest width,

from the pass of Calama, on the Papal and Tuscan frontier, to the right bank of the Enza, on the frontier of Parma, was thirty-seven miles. The area of the province of Modena, in 1901, was 987 square miles. In 1901 the population was 322,617. The duchy had six provinces—Modena, Reggio, Guastalla, Frignano, Garfagnana, Massa-Carrara.

MODICA, a city of Italy, in the province of Syracuse in Sicily, eight miles from the south coast, on the line of railway decreed in 1879 between Syracuse and Licata. It has increased its communal population from 30,547 in 1861 to 50,000 in 1901, and is a well-built and flourishing place.

MOE, JØRGEN ENGBRETSEN, Norwegian poet and comparative mythologist, was born at Hole in Sigdal, Ringerike, Norway, on April 22, 1813, and died in 1882.

MESIA (in Greek, Mysia, or, to distinguish it from the country of the same name in Asia, Mysia in Europe), in ancient geography the territory immediately to the south of the Danube corresponding in the main to Serbia and Bulgaria. It became a Roman province between 27 B.C. and 6 A.D., probably about 16 B.C.

MOFFAT, a health resort of some note in Scotland, is situated in Upper Annandale, Dumfriesshire, occupying an agreeable position at the base of the Gallow Hill, sixty-three miles from Edinburgh and forty-two miles from Carlisle by railway.

MOFFAT, ROBERT, D.D., African missionary, was born at Ormiston, Haddingtonshire, Scotland, on December 21, 1795, and died in 1883.

MOGADOR, or SUERAH, the most southern seaport town on the Atlantic coast of Morocco, and the capital of the province of Haha. In certain states of wind and sea it is turned almost into an island, and a sea-wall protects the road to Saffi. The population is about 15,000 (7,000 Jews, about 150 foreigners). Jews, Protestants, and Roman Catholics have religious edifices in the town.

MOGHILEFF, a northwestern government or province of the Russian empire, situated on the upper Dnieper, between the provinces of Vitebsk and Smolensk on the north and east, Tchernigoff and Minsk on the south and west.

MOGHILEFF ON THE DNEIPEP, a town of Russia, capital of the province of same name. It is situated on both banks of the Dnieper, forty miles south of the Orsha station of the railway between Moscow and Warsaw.

MOGHILEFF ON THE DNIESTER, a district town of Russia, situated in the province of Podolia, on the left bank of the Dniester, eighty-seven miles east-southeast of Kamenets-Podolsk, and forty-three miles from the Zhemerinka railway junction. It has 43,106 inhabitants, nearly one-half of whom are Jews; the remainder are Little Russians, Poles (1,500), and a few Armenians.

MOGILAS, PETRUS, a metropolitan of Kiev from 1632, belonged to a noble Wallachian family, and was born about the year 1600. He died in 1647.

MOGUL, or MUGHAL, the Arabic and Persian form of the word Mongol, usually applied to the Mongol empire in India. (See INDIA.)

MOHÁCS, a market town in the Trans-Danubian county of Baranya, Hungary, stands on the right bank of the west arm of the Danube, twenty-five miles east-southeast of Pécs (Fünfkirchen), with which it is connected by railway. The population in 1900 was about 15,000 (Magyars, Serbs, and Germans).

MOHAIR is the woolly hair of a variety of the common or domestic goat inhabiting the regions of Asiatic Turkey, of which Angora is the center, whence the animal is known as the Angora goat (see GOAT).

The increasing demand for and value of mohair early stimulated endeavors to acclimatize the Angora goat in other regions; but all European attempts have failed, owing to humid and ungenial climates. In 1849 a flock was taken by Dr. J. P. Davis to the United States of America, and since that time many fresh drafts have been obtained and distributed to Virginia and various Southern States, and to California and Oregon in the west. In these high and dry regions the goats thrive; and the flocks in the Western States now number many thousands. The Angora goat has also been introduced into the Cape of Good Hope with much success.

MOHAMMEDANISM. Under this head is given the history of Mohammed and his successors to the fall of the Eastern Caliphate, with a sketch of the institutions and civilization of the Moslem empire and an account of the Koran. The later history must be sought under the names of individual countries and dynasties. What fails to be said of the social and religious aspects of Islam in modern times will be given under the two great divisions of **SUNNITES** and **SHI'ITES**.

MOHAMMED or MAHOMET (The Praised), the founder of Islam, first appears in the full light of history with his Flight to Medina (The Hijra), A.D. 622; and this date, not that of his birth, has been fittingly chosen as the epoch of the Moslem Era. The best-attested tradition places his first appearance as a prophet in Mecca some twelve years earlier (*circa* 610). He was then forty years old: the forty must be taken as a round number, but as such is doubtless trustworthy. Thus the birth of Mohammed falls about 570 A.D.: it is said to have fallen in the year when Abrahá, the Abyssinian viceroy of Yemen, made the expedition against Mecca, mentioned in the Koran.

At the time of Mohammed's birth and youth nothing seemed less likely than that the Arabs should presently make their triumphal entrance into the history of the world as victors over the Greeks and Persians. Nowhere in the Peninsula was there an independent state of any considerable power and importance. At the beginning of the sixth century indeed the princes of Kinda had attempted to form a national kingdom, uniting in particular the tribes of central Arabia; but this kingdom was nothing more than an epic prelude to the true history of the Arabs, which begins with Islam. After the fall of the Kindite dynasty, the old anarchy reigned again among the nomads of the Nejd and the Hijáz; in all other quarters Greek or Persian influence predominated, extending from the frontier deep into the interior by the aid of two vassal states—the kingdom of the Ghassanids in the Haurán under Greek suzerainty, and that of the Lakhmids in Híra and Anbár under the Persian empire.

Mohammed's father, 'Abdalláh b. 'Abdalmottalib, did not live to see the son's birth, and his mother Ámina died while he was still a child. Mohammed was then cared for first by his grandfather, 'Abdalmottalib, and after his death by his oldest paternal uncle, Abú Tálib b. 'Abdalmottalib. He was kindly treated, but shared the hardships of a numerous and very poor family; he herded sheep and gathered wild berries in the desert. This is all that we know of his youth. All else is legend, containing at most an occasional fragment of truth.

It was, we are told, in his twenty-fifth year that Mohammed, on the recommendation of his uncle, entered the house and business of a wealthy widow named Khadíja. For her he made commercial journeys, thus learning to know part of Palestine and Syria. By and by he married the widow, who was much his senior; he was a shrewd man, with prepossessing countenance,

fair of skin and black-haired. The marriage was happy, and blessed with several children. The two sons, however, died young; from the elder the father received the surname Abú'l-Kásim. The most famous of the daughters was Fátima, who married her father's cousin, 'Alí b. Abí Tálib.

During his married life with Khadíja, Mohammed came in contact with a religious movement which had laid hold on some thoughtful minds in Medina, Mecca, and Táif. In Mecca, as elsewhere, Arabian heathenism was a traditional form of worship, chiefly concentrated in great feasts at the holy places; it was clung to because it had come down from the fathers. The gods were many; their importance was not due to the attributes ascribed to them, but to their connection with special circles in which they were worshipped. They were the patrons of septes and tribes, and symbolized, so to speak, the holy unity which united the present and past members of these. Above them all stood Alláh, the highest and universal God. By him the holiest oaths were sworn; in his name treaties and covenants were sealed; the lower gods were not fit to be invoked in such cases, as they belonged to one party instead of standing over both. The enemy was reminded of Alláh to deter him from inhuman outrage; enemy of Alláh was the name of opprobrium for a villain. But, since Alláh ruled over all and imposed duties on all, it was not thought that one could enter into special relation with him. In worship he had the last place, those gods being preferred who represented the interest of a specific circle, and fulfilled the private desires of their worshippers. It is very possible that religion meant more to the sedentary Arabs than to the nomads, to whom almost all the ancient poetry belongs; but the difference cannot have been great. The ancient inhabitants of Mecca practiced piety essentially as a trade, just as they do now; their trade depended on the feast, and its fair on the inviolability of the Harem and on the truce of the holy months.

The religion of the Arabs before Mohammed was decrepit and effete. Many anecdotes and verses prove that indifference and scoffing neglect of the gods was nothing uncommon. The need for a substitute for the lost religion was not very widely felt. But there were individuals who were not content with a negation, and sought a better religion. They were called Hanífs, probably meaning "penitents," men who strive to free themselves from sin. They did not constitute a regular sect, and had in fact no fixed and organized views.

Mohammed, it would appear, came into connection with these Hanífs through a cousin of his wife, Waraka b. Naufal, who was one of them.

That Mohammed did not independently produce his own ideas is indisputable; nor is it to be doubted that he derived them from the Hanífs. But what was the ultimate source of these first motions toward Islam? In general they are ascribed to a Jewish source. Jews were very numerous in Hijáz and Yemen, and had perfectly free intercourse with the Arabs, to whom they undoubtedly imparted a quantity of Biblical and religious material. Mohammed in particular was indebted to the Jews for almost all the stories and a great part of the laws of the Koran (laws of marriage, purity, etc.), and the theological language of Islam is full of Jewish words. But the original and productive forces of Islam did not spring from Judaism, least of all the ideas of the Judgment and of the inexorable demands set before the creature by his Creator, which are so dominant in the older sūras. A distinction must be drawn between the primitive impulses and the material added later; Mohammed did not get his heaven from the Jews, they only

supplied him afterward with meal. Neither in truth can Christianity be viewed as the proper source of Islam—Christianity, that is, in any of its great historical developments. The deepest influence exercised on the Hanifs, and through them on the Prophet, appears to have come from the anchorite ascetics. It was not their doctrine that proved impressive, but the genuine earnestness of their consecrated life, spent in preparation for the life to come, for the day of judgment, and forming the sharpest contrast to the profanity of heathenism. Asceticism and meditation were the chief points with the Hanifs also, and they are sometimes called by the same name with the Christian monks. It can hardly be wrong to conclude that these nameless witnesses of the Gospel, unmentioned in church history, scattered the seed from which sprang the germ of Islam.

The tradition gives a telling story of the way in which Mohammed at length came to proclaim openly what had long been living and working within him; in other words, how he became a prophet. Once, in the month of Ramadan, while he repeated his pious exercises and meditations on Mount Hirá, the angel Gabriel came to him by night as he slept, held a silken scroll before him and compelled him, though he could not read, to recite what stood written on it. This was the first descent of a passage of the heavenly book, the source of revelation from which Moses and Jesus and all prophets had drawn; and so Mohammed was called to be a prophet. The words with which Gabriel had summoned him to read, remained graven on his heart.

When the angel left him—so the tradition runs on—Mohammed came to Khadija and recounted the occurrence to her in much distress; he thought that he was possessed. She however comforted him, and confirmed him in the belief that he had received a revelation and was called as a messenger of God. Yet his doubts returned, and there ensued a break in the revelation, and they reached a distressing height. He was often on the point of seeking death by casting himself down from Mount Hirá. It is usually assumed that this state of anguish lasted from two to three years. Then the angel is said to have suddenly appeared a second time; he came to Khadija in great excitement and said: "Wrap me up! wrap me up!" This, it must be explained, was done when he fell into one of his swoons; and on this occasion, as often the case, the revelation came during an attack. Then was sent down súra lxxiv., beginning with the address: "O thou enveloped one!" Henceforth there was no interruption and no doubt; the revelation followed without break, and the Prophet was assured of his vocation.

Mohammed, in the first three years of his mission, did not appear as a public preacher, but only sought recruits for his own cause and the cause of Alláh in private circles. First, he gained the inmates of his own house—his wife Khadija, his freedman Zaid b. Haritha, his cousin 'Alí, and finally his dearest friend Abúbekr b. Abí Koháfa. The last named won for him several other adherents. Soon there was a little community formed, whose members united in common exercises of prayer.

This indifference of the Meccans embittered Mohammed, and led him to give to his preaching a polemical character which it had not hitherto possessed. It was in his indignation against the cold mockery with which he was met that Mohammed first assumed an attitude of hostility toward polytheism, while at the same time he gave much greater prominence to his own mission, just because it was not acknowledged. He now began to threaten the infidels with the judgment of God for their contempt of His message and His messenger; he related to them the terrible punishments that in other

cases had fallen on those who refused to hear the voice of their prophet, applying the old legends to the circumstances of the present with such directness that it was superfluous expressly to add the morals. This could not fail to irritate the Meccans, especially as after all the new religion gained ground. What Mohammed attacked as ungodly and abominable were their holy things; they were jealous for their gods and their fathers.

The protection of his uncle did not relieve Mohammed from petty insults; but no one ventured to do him serious harm, for the family feud which this would necessarily have produced was not to be lightly incurred. Less fortunate than the Prophet, however, were such of his followers as occupied dependent positions, and had no family support; especially the converted bondmen and bondwomen, who found no consideration, and were often treated with actual cruelty. For some of these Abúbekr purchased freedom. There seem to have been no martyrs, but the situation of many Moslems became so intolerable that they fled to Abyssinia. The Abyssinian Christians were quite looked upon as their religious kinsmen.

A breach with one's people is for the Arab a breach with God and the world; he feels it like a living death. Mohammed, who remained in Mecca, naturally made every effort to heal the breach with his townsmen, and, as naturally, the latter met him half-way. He even went so far as to take the edge from his monotheism, and consequently a reconciliation was effected.

The news of the peace between Mohammed and the Meccans had recalled the fugitive Moslems from Abyssinia; but on their return the actual state of affairs proved very different indeed from what they had been led to expect, and it was not long before a second emigration took place. By degrees as many as a hundred and one Moslems, mostly of the younger men, in little groups, had again migrated to Abyssinia, where they once more met with a friendly reception. Among them were Ja'far, the brother of 'Alí, and the Prophet's daughter, Rokayya, along with her husband 'Othmán b. 'Affán.

Mohammed's position was very considerably altered for the worse, both subjectively and in other respects, by his precipitate withdrawal from the compromise almost as soon as it had been made. He himself indeed, although long and salutarily humbled by the remembrance of his fall, never abandoned faith in his vocation; his followers also did not permit themselves to be led away.

So far as can be gathered, it was at this time that the opposition between Mohammed and his townsmen reached its highest pitch. A personal element, which had lurked from the first in the war of principles, became by degrees increasingly dominant. The idols were less displeasing to Alláh than the idolaters; his own worship was a matter of less concern to him than the recognition of his messenger. With ever-increasing distinctness the prophetic utterances came to be mere words of threatening and rebuke against the Meccans; it was impossible not to recognize in Noah and Moses or Abraham the prophet himself. The coming judgment upon Mecca, and the hour of it, were either in plain words or veiled illusion the continual theme of the "admonisher;" but the oftener and the more urgently it was repeated, the less was the impression it produced. The Meccans did not, on the whole, suffer themselves to be much disturbed by the prospect of the terrible overthrow which was portrayed before them in vivid colors. They were even profane enough to express a desire to see the long-threatened catastrophe arrive at last, and their audacity went so far as to complain of the revelations with which Mohammed sought

to stir their feelings as being tedious. They did not in the least believe that the Biblical narratives, which he related with special pride, were known to him by revelation; on the contrary, they claimed to know perfectly well the human source from which he had derived them. It is very interesting to find Mohammed in presence of their unbelief referring to the recognition and approval with which he met among the children of Israel, and particularly to find him appealing to the testimony of a certain Jew, whom he does not name. Manifestly he had relations with Jews at this period, and was under their influence; and from them, of course, it was that the material of his Old Testament and Haggadic narratives was derived. At the same time it is clear that he himself must have believed these to have come directly to him in a second revelation from above, otherwise he would hardly have taken his stand in the presence of his opponents upon the testimony of the Jews.

The Koraish at last lost all patience. Their heads entered into a solemn compact to break off all intercourse with the Hashimids, as they declined to separate themselves from Mohammed. All buying and selling with the excommunicated persons being forbidden, these found themselves reduced occasionally to outward distress, as well as excluded from all fellowship. This treatment, although apparently never carried out with absolute strictness, did not fail of its effect. The Prophet's more remotely attached adherents fell away from him, and his efforts for the spread of Islam were crippled. All he could do was to encourage those who remained faithful, and to set himself to seek the conversion of his relations.

This state of matters, after continuing for from two to three years, at last became intolerable to the Meccans themselves, who had a variety of relations with the excommunicated family. In the tenth year of the Call (A.D. 619-620) five of the leading citizens paid a visit to the Shi'b Abi Tálib and induced the Banú Háshim and al-Mottalib to come out of their retirement and again appear among their fellow-citizens.

Mohammed was now free once more; but he no longer thought of carrying on his polemic against the Meccans or of seeking to influence them at all. In his relations to them three stadia can be distinguished, although it is easier to determine their character than their chronology. In the first instance, his endeavor was to propitiate them and win them over to his side; when other methods failed, he even went so far as to make complimentary mention of their goddesses in one of his revelations, and thus to set up a compromise with heathenism. When this compromise failed, he forthwith commenced an embittered assault upon the idolaters, which ended in the outlawry of himself and of his family. And now, the ban having been removed, he gave the Meccans up, abandoning them to their hardness of heart. It had become clear to him that in his native town Islam was to make no progress, and that his position was untenable. His feeling of separation was increased all the more with the death of his faithful Khadija about this time, followed soon afterward by that of Abú Tálib, his noble protector. He accordingly came to the determination to take his chance in the neighboring Táif, and set out thither alone. On his arrival he asked the heads of the town whether they would be willing to receive him and protect the free proclamation of his doctrines. He was answered in the negative; the mob drove him out of the town, and pursued him until he found refuge in a vineyard, the property of two noble Meccans. In the present circumstances it was now impossible for him to return into the town, after having openly announced his intention of breaking with it and joining another community.

He did not venture to do so until, after lengthened negotiations, he had assured himself of the protection of a leading citizen, Mot'im b. 'Adi. Notwithstanding all that had happened, he resolved, two months after the death of Khadija, to enter upon a second marriage with Sauda bint Zam'a, a widow of an Abyssinian emigrant.

Chance soon afterward brought to pass what forethought (on his journey to Táif) had failed to accomplish. After having given up the Meccans, Mohammed was wont to seek interviews with the Arabs who came to Mecca, Majanna, Dhú'l-Majáz, and 'Okáz, for the purpose of taking part in the feasts and fairs, and to preach to them. On one such occasion, in the third year before the Flight (A.D. 619-620), he fell in with a small company of citizens of Medina, who to his delight did not ridicule him, as was usually the case, but showed both aptness to understand and willingness to receive his doctrines. Medina was the proper soil for Mohammed's activity. It is singular that he owed such a discovery to accident. He entered into closer relations with the pilgrims who had come thence, and asked them to try to find out whether there was any likelihood of his being received in their town. They promised to do so, and to let him hear from them in the following year.

At the pilgrim feast of next year, accordingly, twelve citizens of Medina had a meeting with Mohammed, and gave him their pledge to have no god but Alláh, to withhold their hands from what was not their own, to flee fornication, not to kill new-born infants, to shun slander, and to obey God's messenger as far as was fairly to be asked. This is the so-called First Homage on the 'Akaba. The twelve men now returned, as propagandists of Islam, to their homes with the injunction to let their master hear of the success of their efforts at the same place on the following year. One of the Meccan Moslems, Mos'ab b. 'Omair, was sent along with or after them, in order to teach the people of Medina to read the Koran, and instruct them in the doctrines and practices of Islam.

Islam spread very quickly on the new soil. It is easy to understand how his joy strengthened the Prophet's spirit to try a higher flight. As a symptom of his exalted frame we might well regard his famous night-journey to Jerusalem, if we could be sure that it belonged to this period. The prophecy also of the final triumph of the Romans over the Persians might very well pass for an expression of his own assurance of victory, as at that time he still had a feeling of solidarity with the Christians. But the prophecy (the only one contained in the Koran) belongs, it would appear, to a much earlier date.

At the Meccan festival of the last year before the Flight (in March, 622), there presented themselves among the pilgrims from Medina seventy-three men and two women who had been converted to Islam. In the night after the day of the sacrifice they again had an interview with the Prophet on the 'Akaba; Al-'Abbás, his uncle, who after Abú Tálib's death had become head of the Banú Háshim, was also present. This is the so-called Second Homage on the 'Akaba, at which Mohammed's emigration to Medina was definitely settled. Al-'Abbás solemnly transferred his nephew from under his own protection to that of the men from Medina, after these had promised a faithful discharge of the duties this involved. They swore to the Prophet to guard him against all they guarded their wives and children from. He, on the other hand, promised thenceforward to consider himself wholly as one of themselves, and to adhere to their society.

The Meccans soon got wind of the affair, notwithstanding the secrecy with which it had been gone about,

but Ibn Cbay, the leader of the Medina pilgrim caravan, whom they questioned next morning, was able with good conscience to declare that he knew nothing at all about it, as, being still a heathen, he had not been taken into the confidence of his Moslem comrades, and he had not observed their absence over night. The Meccans did not gain certainty as to what had occurred, until the men of Medina had left. They set out after them, but by this they gained nothing. They next tried, it is said, violently to prevent their own Moslems from migrating. After a considerable pause, they renewed the persecution of the adherents of the Prophet, compelling some to apostasy, and shutting up others in prison. But the measures they adopted were in no case effective, and at best served only to precipitate the crisis. A few days after the homage on the 'Akaba, Mohammed issued to his followers the formal command to emigrate. In the first month of the first year of the Flight (April, 622), the emigration began; within two months some 150 persons had reached Medina. Apart from slaves, only a few were kept behind in Mecca.

Mohammed himself remained to the last in Mecca, in the company of Abúbekr and 'Alí. His reason for doing so is as obscure as the cause of his sudden flight. The explanation offered of the latter is a plan laid by the Meccans for his assassination, in consequence of which he secretly withdrew along with Abúbekr. For two or three days the two friends hid themselves in a cave of Mount Thaur, south from Mecca, till the pursuit should have passed over. They then took the northward road, and arrived safely in Medina on the 12th of Rabi' of the first year of the Flight. Meanwhile 'Alí remained three days longer in Mecca, for the purpose, it is alleged, of restoring to its owners all the property which had been intrusted for safe keeping to the Prophet. The Koraish left him entirely unmolested, and threw no obstacle in his way when, at last, he took his departure.

With the Flight to Medina a new period in the life of the Prophet begins; seldom does so great a revolution occur in the circumstances of any man. Had he remained in Mecca he would, in the best event, have died for his doctrine, and its triumph would not have come until after his death. The Flight brought it about that he, the founder of a new religion, lived also to see its complete victory—that in his case was united all that in Christendom is separated by the enormous interval between Christ and Constantine. He knew how to utilize Islam as the means of founding the Arabian commonwealth; hence the rapidity of its success.

The circumstances in which Mohammed found the city were singularly fitted to change the religious influence which the new prophet brought along with him into another of a political character, and, from being a prophet, to make him the founder of a commonwealth. The Arabs had hitherto been accustomed to lay before their Káhins, or priestly seers, at the sanctuaries, for decision in God's name, all sorts of disputes and hard questions which ordinary means were inadequate to decide. The religious prestige which Mohammed enjoyed led directly to his being frequently called in as adviser and judge. In Medina quarrels and complications were abundant, and an authority to stand over both parties was much needed. Mohammed met this need in the manner which was most acceptable to the Arabs; the authority he exercised did not rest upon force, but upon such a voluntary recognition of the judgment of God as no one had any need to be ashamed of. The expedient of giving one's self out for the messenger of God, and one's speech as the speech of God, is of no avail to one who finds no credence; and credence, such as Mohammed received, is not given for any length of time, to either an imposter or a dupe. Even the respect in

which he was held as a prophet would have helped him little if his decisions had been foolish and perverse. But they were in accordance with truth and sound understanding; he saw into things, and was able to solve their riddle; he was no mere enthusiast, but a thoroughly practical nature as well.

It was not long before he was able to demand as of right that which, in the first instance, had been a voluntary tribute. "Every dispute which ye have one with another ye shall bring before God and Mohammed;" so runs the text in the original constitution for Medina, set up in the first years after the Flight; and in the Koran a rebuke is given to those who continue to seek the administration of justice at the hands of the false gods, *i.e.*, of their priests and seers. With incredible rapidity the Prophet had come to be the most powerful man in all Medina.

Mohammed had thus laid the foundations of his position in a manner precisely similar to that which Moses is said to have followed; and just as the Torah grew out of the decisions of Moses, so did the Sonna out of those of Mohammed. It was perhaps in judicial and regulative activity, which he continued quietly to carry on to the very end of his life, that his vocation chiefly lay. At all events his work in this direction was extremely beneficial, if only because he was the creator of law and justice where previously there had been nothing but violence, self-help, or at least voluntary arrangement.

Mohammed's hostility to the Jews found expression, in the first instance, theoretically more than practically, and especially in the care with which he now differentiated certain important religious usages which he had taken over from Judaism, so that they became distinguishing marks between Islam and Mosaism. Of these alterations the greatest in positive importance is the transference of the Kibla to Mecca. It symbolizes the completion of the Arabizing process which went on step by step with the change which Islam underwent from being an individual to being a political religion. In substituting the Meccan Ka'ba for the sanctuary at Jerusalem, Mohammed did not merely bid farewell to Judaism and assert his independence of it; what he chiefly did was to make a concession to heathenism, and bring about a nationalization of Islam for the purpose of welding together the Arab tribes into one community. Of similar significance was the institution of the feast of sacrifice on the day of the Meccan festival. The Moslems were to observe the latter as much as possible, even if they could not be actually present on the spot.

Thus we have the five chief precepts of Islam—(1) Confession of the unity of God; (2) stated prayer; (3) alms-giving; (4) the fast of Ramadan; (5) observance of the festival of Mecca. Capable of having deeper meanings attached to them, but meritorious also, even in a merely external observance, they were an excellent instrumentality for producing that *esprit de corps*, that obedience to Alláh and his messenger, which constituted the strength of the Moslem system. Up till that time blood-relationship had been the foundation of all political and social relations in Arabia; upon such a foundation it was impossible to raise any enduring edifice, for blood dissociates as much as it unites. But now, religion entered upon the scene as a much more energetic agent in building the social structure; it ruthlessly broke up the old associations, in order to cement the thus disintegrated elements into a new and much more stable system.

The Emigrants (Mohájira) who along with the Prophet had fled from Mecca, were the kernel and the cement of the community. Mohammed seems at first to have cherished the design not only of entirely disowning relationship with the non-Moslems, but also of obliterat-

ing as much as possible, within Islam, the distinctions of blood, by means of the common faith. He established between emigrants and individual citizens of Medina relationships of brotherhood, which also involved heirship. But he soon abandoned this line, and expressly recognized the validity and sacredness, *within Islam*, of the old rights of family and inheritance. At a subsequent period, he even conceded to relationship and the ties of blood far larger rights than were compatible with Islam, and thus himself laid the foundations of the violent quarrel which rent the community, more particularly in the time of the Omayyads. Similarly it might be said that communism was originally involved in the principles of Islam; but it is characteristic that from the first the alms were less employed for the equalization of society, than for strengthening the hands of the ruling power.

The founding of the state upon the feeling of fellowship generated by religion, was without question the Prophet's greatest achievement; the community of Medina was the tool, its heroic faith the force, by means of which Islam attained the results which figure so largely in the history of the world. Moslem tradition, however, does not stop to inquire what it was that constituted the inward strength of Islam, but goes on at once to relate what were its outward manifestations. Its information on the subject of the period of Mohammed's sojourn in Medina is given under the title of "the campaigns of the apostle of God." With a few of the smaller tribes in the neighborhood of Medina (Johaina, Mozaina, Ghifâr, Aslam), and with the Khozâ'a, Mohammed maintained relations of peace and amity; benevolent neutrality gradually grew into alliance, and finally union with the commonwealth of Medina. But toward all the rest of Arabia his very principles placed him in an attitude of war. Ever since Islam from being a religion had become a kingdom, he was compelled to vindicate, by means of war against unbelievers, its claims to supremacy; the conflict of principles had to be settled by the sword, the sole sovereignty of Allâh demonstrated by force to the rebels who showed unwillingness to accept it.

The nearest object against which to direct a holy war was presented by the Meccans. Against them first did Mohammed bring into operation the new principle, that it is faith and not blood that separates and unites.

The first plunder was taken in the month Rajab A.H. 2 (Autumn 623), in which circumstance was at once seen the advantage arising from the change of conscience brought about by the new religion; for in Rajab feuds and plundering raids were held to be unlawful. Relying upon the sacredness of this month a caravan of Koraish was returning from Taïf laden with leather, wine, and raisins. But this did not prevent Mohammed from sending out a band of Emigrants to surprise the caravan at Nakhla, between Taïf and Mecca; his orders to this effect were given in a document which was not to be unsealed until two days after the departure of the expedition. The plan was carried out, and the surprise was all the more successful, because the robbers gave themselves the outward semblance of pilgrims; one Meccan was killed in the struggle.

The Koraish still remained quiet; another outrage had yet to come. In Ramadan A.H. 2, the return of their great Syrian caravan was expected, and Mohammed resolved to lie in wait for it at Bedr, a favorite watering-place and camping-ground, northward from Medina. For this purpose he set out thither in person along with 308 men; but the leader of the caravan, the Omayyad Abû Sofyân, got word of the plan and sent a messenger to Mecca with a request for speedy help. Concern about their money and goods at last drove the Koraish

to arms; a very short interval found them, 900 strong, on the road to Bedr. By the way they received intelligence that the caravan had made a circuit to the west of Bedr, and was already in safety. Nevertheless they resolved, at the instance of the Makhzumit Abû Jahl, for the sake of their honor, to continue their march. When the Moslems first got touch of them at Bedr, they took them for the caravan; their surprise on discovering the truth may be imagined. But, kept firm by the courage of their leader, they resolved to face the superior numbers of the enemy. On the morning of Friday the 17th of Ramadan, the encounter took place. A number of duels were fought in the front, which were mostly decided in favor of the Moslems. The Meccans at last gave up the fight, strictly speaking for no other cause than that they did not see any reason for carrying it on. They were reluctant to shed the blood of their kinsmen; they were awestruck in presence of the gloomy determination of their adversaries, who did know what they were fighting for, and were absolutely reckless of consequences. After a number of the noblest and oldest of the Koraish, including at last Abû Jahl, had fallen, those who remained took to flight. The number of the dead is said to have been as great as that of the prisoners. Two of the latter, whom he personally hated, Mohammed caused to be put to death.

The battle of Bedr is not only the most celebrated of battles in the memory of Moslems; it was really also of great historical importance. It helped immensely to strengthen Mohammed's position. Thenceforward open opposition to him in Medina was impossible; families which had hitherto withdrawn themselves from his influence were so thoroughly cowed by some atrocious murders carried out in obedience to his orders, that they went over to Islam. He was now in a position to proceed to break up the autonomy of the Jews.

The Meccans also were very deeply impressed by the defeat inflicted on them by the Moslems. They saw clearly that the blow must be avenged, and they took comprehensive measures for their campaign. After a year's delay, their preparations being now complete, and their allies assembled, they set out under the command of Abû Sofyân, and without any check reached Medina, where they pitched their camp to the northeast of the city, in the green corn-fields by Mount Ohod. In Medina the elders were for awaiting the attack on the town and defending themselves within it, but the young men hurried the Prophet into the determination to meet the enemy without the gates; this resolution once come to he persevered in, even after those who had urged him to it had changed their minds. On the morning of Saturday, the 7th of Shawwâl, A.H. 3 (January, February, 625), the armies met. At first the battle seemed to be going once more in favor of the Moslems; one after another the standard-bearers and champions of the enemy fell, the whole host wavered, and even the camp was gained. But here their lust for plunder did them an evil turn. Mohammed had covered his left flank against the Meccan horsemen by a number of bowmen, whom he had ordered on no account to leave their post. But as soon as they saw that the enemy's camp was taken, they threw off all discipline, and determined to have their share of what was going. It thus became possible for the Meccan cavalry to fall upon the Moslem rear, and snatch back the victory that had already been won. In the confusion which now ensued Mohammed himself was wounded in the face, and for some time lay for dead on the ground. Among the slain was found his uncle, Hamza b. 'Abdalmottalib, "the lion of God;" his liver was cut out and carried to Abû Sofyân's wife, Hind bint 'Otba, whose father had been killed by Hamza at Bedr. The principal event of A.H. 4 was the

expulsion of the Banú Nadír, the most distinguished and powerful Jewish family in Medina Summer, 625). Mohammed, under some pretext, suddenly broke with them and ordered their departure within ten days, on pain of death. Relying upon the support of Ibn Obay, they resolved to resist, and sustained a siege within their walls; but the ally they had counted on proved a broken reed, and they were soon compelled to surrender. They were permitted to withdraw, taking with them all their movable property except their arms. With music and roll of drum, the women in gala dress, they marched through the streets of Medina, on their way to Khaibar, where they had property. Their land the Prophet appropriated to himself; the income derived from it could be employed to meet the numerous claims that were made upon him. He seems also to have handed over some of it to the Emigrants, who until then had acquired no property in land in Medina.

Meanwhile, the Banú Nadír were not idle in Khaibar, but left no stone unturned to annihilate their mortal enemy. They succeeded in bringing about an alliance of the Koraish and the great Bedouin tribes of Solaim and Ghatafán, for the suppression of Islam. In the month Dhú 'l-ka'da, A.H. 5 (March, 627), the three armies set out, 10,000 strong, under the command of Abú Sofyán. Mohammed received word of this through the Khozá'a, who secretly played into his hands, and on this occasion he resolved, not as formerly to offer battle on the open field, but to make preparation for a siege. One stormy night the Meccans suddenly raised the siege after it had lasted fourteen days, and returned home. They were followed by the Ghatafán and Solaim. It was with no small joy that the Moslems, on the following morning, discovered the departure of the enemy; it would have been impossible for them to have held out much longer, exhausted as they were, not less by cold and hunger than by the fatigues of constantly mounting guard. As soon as Mohammed had given them permission to leave the camp beside the hill of Sal', they dispersed with the greatest alacrity to their homes.

Mohammed, however, did not allow them much time to recruit. Hardly had they reached their abodes, when he again called them to arms against the treacherous Koraiza. The unlucky Jews had been given over to the sword by the withdrawal of the allies; a siege of fourteen days compelled them to surrender unconditionally. The men were driven in chains to the house of Osáma b. Zaid, whence, on the following morning, Mohammed caused them to be brought, one by one, to the market place of Medina, and there executed. This continued till late in the evening. They were 600 or 700 in number, and among them was the Nadirite Hoyay b. Akhtab, the author of the War of the Fosse, who had left the Meccans to join his fortunes with those of the Koraiza. By accepting Islam these men could have saved their lives, but they preferred death. The women and children were sold into slavery; one young woman only, Banána, suffered the penalty of death for having broken the head of a Moslem with a millstone during the siege. The Prophet selected for himself the fair Raihána, and married her, after having caused her to become a convert to Islam.

The War of the Fosse was the last attack made by the Koraish upon Medina; Mohammed now began to take the offensive toward Mecca. This he at first set about with extreme diplomacy, utilizing the festival, and the truce of God subsisting at the time of the festival, for the purpose of paying a visit to his native town. Although unsuccessful in winning to his side the neighboring tribes of Bedouins, it was nevertheless with a considerable following (1,500 men) that he set out on his journey. In a dream he had had the key of the Ka'ba delivered to

him; on the strength of this his followers believe firmly in the success of the expedition. But the Koraish were determined that the pretext of pilgrimage should not avail their adversary; they summoned their allies and formed a camp to the north of their town for the purpose of preventing the entrance of the Moslems. Mohammed was forced to halt at Hodaibiya on the borders of the sacred territory, and it was in vain that by fair speeches he sought to obtain permission to make the circuit of the Ka'ba. The Koraish judged it best to offer a bargain with Mohammed, the terms being that for this year he was to withdraw, so that the Arabs might not say that he had forced an entrance, but that on the following year he was to return and be permitted to remain three days within the sacred territory for the purpose of sacrifice. The first result of the treaty was that the Khozá'a declared for alliance with Mohammed; while, on the other hand, the Bekr b. Kinána joined themselves to the Koraish.

To compensate his followers for the apparent resultlessness of this expedition, Mohammed immediately after their return led them out against the rich Jews of Khaibar (northward from Medina), whither the Banú Nadír had migrated, and from which place they had unceasingly stirred up opposition against the Prophet. Hitherto he had contented himself with putting out of the way, by means of assassination, some of their leading men who seemed to him to be particularly dangerous, such as Abú Ráfi' and Yosair b. Razim, but now he resorted to wholesale measures. In May, 628, he made his appearance before Khaibar with a powerful army; in the plunder only those who had taken part in the expedition of Hodaibiya were to share, but many others besides accompanied them. The Jews, although aware of the hostility of Mohammed's intentions, were nevertheless taken completely by surprise when one morning they saw him and his troops encamp before their strongholds.

Citadel after citadel fell into the hands of the Moslems; treachery, which had something to do with the surrender, was well-nigh superfluous. From Al-Natát the Jews were driven to Al-Shikk, and at last nothing was left to them but Al-Katiba (with Al-Watih and Solálim). There they remained shut up and filled with fear, without even risking, as formerly, single combat and skirmishes before their citadels. After some time, they asked for peace, and obtained it on the footing that they retained their lives, wives, and children, and one garment each, but gave up all their property, the penalty of concealing anything being death. Kinána b. b. Abí 'l-Hokaf was cruelly tortured, and at last put to death because he had buried the renowned jewels of his family; thus at the same time his handsome wife Safiya bint Hoyay was left free for Mohammed.

His marriage with "the daughter of the king" wound up the prosperous campaign. Safiya felt no repulsion toward the man who had caused the death of her father Hoyay, and of her husband Kinána; she gracefully accommodated herself to the situation. More worthy was the demeanor of another Jewess, Zainab, who made the attempt to poison the executioner of her people, and atoned for this offense by her death. The attempt was unsuccessful, but Mohammed^d believed that even in his last illness he could trace the effects of the poison.

The peace of Hodaibiya, with the subsequent conquest of Khaibar, closes the first period of Mohammed's life at Medina; strictly speaking, indeed, it merely confirmed the status which in point of fact the War of the Fosse had already given him.

As a religion Islam did not attract the Arabs; they had no inclination to pray, read the Koran, and give

alms. Of this they had given sufficient evidence by their perennial feuds with Mohammed, and by the murder of divers of his missionaries who were sent to teach them the faith. We can hardly believe that a new spirit now suddenly possessed them. Their change of attitude was merely due to the imposing effect of the rising might of Islam. They began to respect the Moslems, who, in spite of their small numbers, could defy a whole world, because they were of one mind, and did not ask what the world thought. They saw that, in the great conflict between Mecca and Medina, in which as actors or as spectators they had all participated, the victory inclined more and more to the side of Medina, that force could accomplish nothing against faith. There was, moreover, another argument in favor of the new religion, to which the Arabs were very sensible—the rich booty, to wit, which the Moslems acquired by their continual forays. There is no question that the material success of Islam was the chief force that attracted new adherents.

The treaty of Hodaibiya gave a breathing space to the two combatants, and of this the prophet reaped the whole advantage. The truce, which lasted for almost two years, brought to the Meccans an almost unbroken series of humiliations and losses. Next year they looked on with shame and concealed indignation when the Prophet, availing himself of his stipulated right, entered the city with 2,000 men, and performed the sacred ceremonies (March, 629). Still they were afraid to break with him again, and did not even venture to rid themselves of his spies, the Khozá'a, who lived in their midst. They had lost confidence in themselves; they knew that the fight was not fought out, but they dared not seek to bring it to a decision.

Against their will the decision came. The Banú Bekr fell upon Mohammed's friends, the Khozá'a, and were supported by some of their Koraishite allies. The Khozáites complained to the Prophet, who eagerly seized the pretext for war. In vain did the Meccans send Abú Sofyán to Medina to renew the truce; they could not move the Prophet from his purpose. In January, 630, he moved against Mecca with an army of 10,000 men. The Moslems were on the border of the holy land before the Meccans suspected their approach; then suddenly one night 10,000 fires were seen rising to heaven to the northwest of the holy city. The Moslems entered the city from several sides at once, meeting only at one point with an easily quelled resistance. Mohammed insisted that there should be no violence; he pledged the captains to avoid all bloodshed. Ten persons only were put to the ban, and of these one-half were subsequently pardoned. He took all pains to preserve the sanctity of Mecca unimpaired, confirmed the rights and privileges therewith connected, and made it plain that the old cultus should not be less flourishing under Islam. The ceremonies were retained, save only that he abolished all idols, both the domestic gods found in every house and the images in and round the Ka'ba. But every sanctuary outside of Mecca was destroyed, except such as had a part in the celebration of the Feast, and so stood in connection with the Ka'ba itself. Thus the Meccan worship gained a new and unique importance. Mohammed's reform did for Mecca what Josiah's did for Jerusalem.

The last step toward that identification of the Ka'ba with Islam, which made it the religious center of the Moslem world, was not taken till the following year, when the famous Renunciation of sur. ix. forbade the heathen to share in the Feast, which was henceforth to be a strictly Moslem ordinance, and at the same time abrogated the peace of the holy months. A year later (Dhú 'l Hija, A. H. 10, March, 632) he himself celebrated

the Feast for the first time in the orthodox fashion, introducing certain modifications on the traditional practice and reducing certain varieties of use to uniform rule. In all this he professed to reestablish the true ancient use, purged of heretical deviations from the example of Abraham. At the same time he remodeled the Calendar, forbidding the occasional interpolation of a month as an arbitrary and human invention, and establishing the true lunar year of twelve lunations.

The last years of the Prophet were like the ingathering of a harvest laboriously reaped. The conquest of Mecca, so great was the impression it produced, was called "*the Conquest*," as if it contained in itself all others. From every side, in the next two years, the sheikhs streamed to Medina to open negotiations for the acceptance of Islam by their tribes; if they did not come spontaneously, Mohammed sent to them. A change of heart on the part of the Arabs had no more share in these than in former conversions. It cost them no struggle to cast away their idols; the images and the sanctuaries fell quietly enough. Heathenism was a dead thing; superstitions could be transplanted into Islam. The unique sovereignty of Alláh was clearly evidenced in the fact that no might could withstand his. It is safe to affirm that the accessions to Islam were due to political more than religious impulses, and meant adherence to the state of Medina rather than to monotheism. The power to which that city had grown, acted as a force of attraction upon the Arabs; and their subjection was not the mere effect of fear, but expressed also that sense of the necessity for peace and order, which had led to the founding of states in the two previous centuries. Thus it becomes intelligible that from every side, by a sort of natural necessity, the masses of Arabian society were drawn toward the center of attraction at Medina, and that the Prophet received the homage of distant tribes which he could not have influenced directly. The Christian tribes were not behind the rest, they were Arabs first and Christians after. Only the Christians of Najrán remained true to their faith; so did the Jews in all parts, and the Magians in the province of Bahrain. The last named, as idolaters, ought not in strictness to have been tolerated in the Moslem state; but practical considerations broke through theory, and the men of system had to accept the inconsistency with the best grace they could.

The signs of submission were—(1) the performance of the five daily prayers, or at least the proclamation of the times of prayer by the Muedhdhin; (2) the payment of the alms-tax; (3) the acceptance of the Moslem Law, which was introduced by qualified delegates from Medina. Otherwise things remained as they were; Mohammed was careful not to meddle with tribal affairs, and strengthened the existing aristocracies wherever he could do so. The change of faith was effected by treaty; the populace was not consulted, and the whole negotiations were directed by the Elders and Chiefs. For, in fact, purely political interests were involved.

The pilgrimage undertaken by Mohammed in the year 10 (March, 632), was like a very triumph. All Arabia, apart from the vassals of Persia and Greece, lay at his feet. The greatest success of his life had been effected by sheer moral force without a stroke of the sword. But Arabia no longer sufficed him; he had wider aims. In his last years he began to extend the holy war against the Greeks. Even on his return from Hodaibiya, he began to direct envoys to several foreign potentates, with letters demanding their adhesion to Islam. One of these envoys was seized and beheaded in the Belká (the ancient Moab). Hence sprang the first campaign against the Greeks, *i. e.*, the Arabs who were subject to the Greek empire. The army directed

against them was, however, entirely defeated at Mu'ta (Autumn, 629); Khālid succeeded with difficulty in rallying and leading back the broken remnant of the host. Next summer the Nabateans who visited the market of Medina spread a rumor that the Emperor Heraclius was collecting a vast force to attack the Moslems; and Mohammed set forth to meet him at the head of 30,000 men, but got no farther than Tabūk, on the southern borders of ancient Edom, when the rumor was found to be false. The expedition, however, was not altogether fruitless, as it led to the submission of several small Jewish and Christian communities in the north of the Peninsula. Mohammed equipped a new expedition against the Greeks on his return from his "farewell pilgrimage," and it was just ready to start when he died, on Monday, June 8, 632.

After his death arose the question who was to be his "representative" (Khalifa, Caliph). The choice lay with the community of Medina; so much was understood; but whom were they to choose? The natives of Medina believed themselves to be now once more masters in their own house, and wished to promote one of themselves. But the Emigrants asserted their opposing claims, and with success, having brought into the town a considerable number of outside Moslems, so as to terrorize the men of Medina, who besides were still divided into two parties. The Emigrants' leading spirit was 'Omar; he did not, however, cause homage to be paid to himself but to Abūbekr, the friend and father-in-law of the Prophet.

The affair would not have gone on so smoothly, had not the opportune defection of the Arabians put a stop to the inward schism which threatened. Islam suddenly found itself once more limited to the community of Medina; only Mecca and Táef remained true. The Bedouins were willing enough to pray, indeed, but less willing to pay taxes; their defection, as might have been expected, was a political movement. None the less was it a revolt from Islam, for here the political society and the religious are identical. A peculiar compliment to Mohammed was involved in the fact that the leaders of the rebellion in the various districts did not pose as princes and kings, but as prophets; in this the secret of Islam's success appeared to lie.

Abūbekr proved himself quite equal to the perilous situation. In the first place, he allowed the expedition against the Greeks, already arranged by Mohammed, quietly to set out, limiting himself for the time to the defense of Medina. On the return of the army he proceeded to attack the rebels. The holy spirit of Islam kept the men of Medina together, and inflamed them to a death-defying zeal for the faith; while on the other side, the Arabs as a whole had no other bond of union and no better source of inspiration than universal egoism. As was to be expected, they were worsted; eleven small flying columns of the Moslems, sent out in various directions, sufficed to quell the revolt. Those who submitted were forthwith received back into favor; those who persevered in rebellion were punished with death. The majority accordingly converted, the obstinate were extirpated. In Yamāma only was there a severe struggle; the Banū Hanifa under their prophet Mosailima fought bravely but here also Islam triumphed.

After the subjugation of Middle and North-Eastern Arabia, Khālid b. al-Walid proceeded by order of the Caliph to the conquest of the districts on the lower Euphrates. Thence he was summoned to Syria, where hostilities had also broken out. Damascus fell late in the summer of 635, and on August 20, 636, the great decisive battle on the Hieromax (Yarmūk) was fought, which caused the emperor Heraclius finally to abandon Syria. In 639 the armies of Syria and 'Irāk were face

to face in Mesopotamia. In a short time they had taken from the Aryans all the principal old Semitic lands—Palestine, Syria, Mesopotamia, Assyria, and Babylonia. To these was soon added Egypt, which 'Amr b. al-Ās, aided by the national and confessional antipathies of the Copts toward the Greeks, overran with little trouble in 641.

It would have been a great advantage for the solidity of the Arabian empire if it had confined itself within the limits of those old Semitic lands, with perhaps the addition of Egypt. But the Persians were not so ready as the Greeks to give up the contest; they did not rest until the Moslems had subjugated the whole of the Sasanid empire. The most important event in the protracted war which led to the conquest of Eran, was the battle of Nehāwend in 641; the most obstinate resistance was offered by Persis proper, and especially by the capital, Istakhr (Persepolis). In the end, all the numerous and somewhat autonomous provinces of the Sasanid empire fell, one after the other, into the hands of the Moslems, and the young Shahanshah, Yazdegerd, was compelled to retire to the farthest corner of his realm, where he came to a miserable end. The course of Islam's political history during its first centuries is denoted by the removal of the capital from Damascus to Cufa, and from Cufa to Baghdād, the latter occupying approximately the site of the ancient Ctesiphon.

But we must return to the period of Abūbekr. He died after a short reign, on August 22, 634, and as matter of course was succeeded by 'Omar. To 'Omar's ten years' Caliphate belong for the most part the great conquests. He himself did not take the field, but remained in Medina; he never, however, suffered the reins to slip from his grasp, so powerful was the influence of his personality and the Moslem community of feeling. He died in the beginning of November, 644.

Before his death 'Omar had nominated six of the leading Emigrants who should choose the Caliph from among themselves—'Othmán, 'Alī, Zobair, Talha, Sa'īd b. Abī Wakkās, and 'Abd al-Rahmán b. 'Auf. The last named declined to be a candidate, and decided the election in favor of 'Othmán b. 'Affān. Under this weak sovereign the government of Islam fell entirely into the hands of the Koraish nobility. Othmán was killed at the age of eighty.

Controversy now arose among the leaders of the opposition as to the inheritance. The mass of the mutineers summoned 'Alī to the Caliphate, and compelled even Talha and Zobair to do him homage. But soon these two, along with 'Aīsha, the mother of the faithful, who had an old grudge against 'Alī, succeeded in making their escape to 'Irāk, where at Basra they raised the standard of rebellion. 'Alī in point of fact had no real right to the succession, and moreover was actuated not by piety but by ambition and the desire of power, so that men of penetration, even although they condemned 'Othmán's method of government, yet refused to recognize his successor. The new Caliph, however, found means of disposing of their opposition, and at the battle of the Camel, fought at Basra in November, 656, Talha and Zobair were slain, and 'Aīsha was taken prisoner.

But even so 'Alī had not secured peace. With the murder of 'Othmán the dynastic principle gained the twofold advantage of a legitimate cry—that of vengeance for the blood of the gray-haired Caliph, and of a distinguished champion, the Syrian governor Mo'āwiya. Mo'āwiya was not inclined to recognize 'Alī, and the latter did not venture to depose him. To have done so would have been useless, for Mo'āwiya's position in Syria was impregnable. 'Alī was murdered (end of January, 661), thereby posthumously attaining an im-

portance in the eyes of a large part of the Mohammedan world (Shi'a) which he had never possessed during his life. His son Hasan made peace with Mo'awiya.

'Alī left two sons, Hasan and Hosain. The people of 'Irāk chose Hasan Caliph. But he, not having his father's energy, recoiled before the prospect of a war with Mo'awiya. He abdicated, and only demanded, in exchange for the power which he resigned, pardon for his relatives and a yearly pension of five millions of dirhems (1 dirhem = 2 cents), together with the revenues of the Persian city of Dārābgird. A treaty to this effect was concluded between Mo'awiya and Hasan, in spite of the opposition of Hosain, who exhorted his brother to continue the struggle; and Mo'awiya entered Cufa at the head of his army, according to some authorities, toward the end of the month Rabi' I., A. H. 41 (July, A. D. 661), according to others a month or two later. Hasan retired to Medina, where he died eight or nine years afterward, poisoned, it is said, by order of the Caliph.

Mo'awiya, who now remained sole master of the Moslem empire, was, however, not yet universally acknowledged. Five thousand Khārijites made head against him in the province of Ahwāz, the ancient Susiana, and a revolt broke out at Basra. Ziyād himself, Mo'awiya's brother, refused to take the oath to him and fortified himself at Istakhr, the ancient Persepolis. After acknowledging Ziyād, who thus became Ziyād son of Abū Sofyān, Mo'awiya intrusted him with the government of Basra and of Persia, and afterward with that of Cufa, when Moghīra b. Sho'ba died. Ziyād governed 'Irāk, with the greatest vigor, to the full satisfaction of Mo'awiya, who further placed the whole of Arabia under his authority; but in that same year, A. H. 53 (A. D. 672-673), Ziyād died. It seems that Mo'awiya had thought of him as his successor in the Caliphate. After Ziyād's death the Caliph wished to secure the throne for his own son Yazīd. This was a new violation of the customary rights of Islam; for Mohammed, whose actions served as a rule, had not in his lifetime appointed anyone as his successor.

Yazīd had not his father's genius. Passionately fond of pleasure, and careless about religion, he bestowed more care on turning a pretty couplet than on consolidating the strength of his empire. During his short reign he committed three actions for which Moslems never pardoned his memory; the murder of Hosain, son of 'Alī and grandson of the Prophet; the pillage of Medina; and the taking of the Ka'ba, the venerated temple of Mecca; crimes which were not redeemed in the eyes of the people by a few fortunate expeditions on the part of his generals.

At Mecca the news of the killing of Hosain was received with a degree of indignation of which 'Abdallāh b. Zobair took advantage to assume the title of Caliph. At the news of this revolt, Yazīd first sent an ambassador to Medina. This step proving fruitless, he next collected an army of from ten to twelve thousand Syrians, and intrusted their command to Moslim b. 'Okba, who passed, and with good reason, for a man who would recoil from nothing. This general marched against Medina, took it, after a battle known as the day of Harra, August 26, 683, and gave up the city for three days to massacre and pillage. Torrents of blood flowed, and hence Moslim b. 'Okba received the surname of *Mosrif* (the Prodigal). After a siege of two months, Ibn Zobair was beginning to despair, when he received, through an Arab of the desert, news of the death of Yazīd. The Caliph had in fact died on Rabi' I. 15, (November 11, 683). Hosain b. Nomair immediately offered the Caliphate to Ibn Zobair, on condition that he should grant a complete amnesty to all those who had taken part in the battle of Harra and in the siege

of Mecca. 'Abdallāh had the folly to refuse, and Hosain then returned to Damascus.

Thus rid of his enemy, 'Adallāh caused the title of Prince of the True Believers to be conferred on him—a title which 'Omar had already received, and which was afterward adopted by all the Caliphs.

It was in the midst of this break up of his party that, immediately after the death of Yazīd, his eldest son, Mo'awiya II. was elected Caliph at Damascus at the age of only seventeen or twenty. He was a young man of weak character, and imbued, it is said, with Shi'ite opinions. He felt himself incapable of ruling, and was contemplating abdication, when he died, after a reign of but forty days, by poison, as some say; of the plague, as others assert.

Merwān b. al-Hakam had been secretary to the Caliph 'Othmān, and governor of Medina under Mo'awiya I. Yazīd, on his accession to power, had dismissed him and put Walīd b. 'Otha in his place; but Merwān had continued to live at Medina, and had been driven from it during the revolt of the year 63, and again in the following year, when 'Obaid Allāh b. Zobair had taken possession of that city in the name of his brother.

At the beginning of the year 65 (A. D. 684-685) Merwān returned in haste to Syria; for, during his absence, a brother of Ibn Zobair, named Mos'ab, had invaded that province.

When 'Abd al-Melik ascended the throne, there still remained much to be done before the unity of the empire could be reestablished. Ibn Zobair was still master of Arabia and of 'Irāk, though in the latter province his authority was very much shaken by the permanent rebellion of the Shi'ites at Cufa, and of the Khārijites at Basra.

The Omayyad Caliph, whose troops had been beaten in Mesopotamia, and who had been hitherto content to watch the frontiers of Arabia, was again prevented from pushing on military operations more actively by the breaking out of troubles in Syria. Scarcely had he suppressed this revolt, when the Emperor of Constantinople, Justinian II., in violation of the thirty years' truce formerly concluded between Mo'awiya I. and Constantine IV., sent a Greek army to invade Syria. 'Abd al-Melik was obliged to buy peace for the time, for he required all his forces to dispute the empire with the son of Zobair. He consented, it is asserted, to pay the Greeks an indemnity of 1,000 pieces of gold weekly. He then gave his attention to the renewal of the projected expedition against 'Irāk.

Only Arabia now remained to Ibn Zobair. In A. H. 72 'Abd al-Melik made preparations for depriving him of it. Accordingly he raised an army; but when his generals found that another siege of Mecca was in contemplation, not one of them was willing to accept such a mission. An obscure officer, Hajjāj b. Yūsuf, boldly offered to lead the expedition. Hajjāj set out, traversed the Hijāz without resistance, and pitched his camp at Táif, not far from Mecca. Ibn Zobair tried to dislodge him; but in the frequent encounters between his troops and those of Hajjāj, the latter always had the advantage. 'Abd al-Melik then decided on sending him a reinforcement of five thousand men, on receiving which Hajjāj invested Mecca. The blockade lasted several months, during which the city was a prey to all the horrors of siege and famine. Hajjāj had set up balistas on the neighboring heights, and poured a hail of stones on the city and the Ka'ba. Famine at length triumphed over the last adherents of the son of Zobair. Ten thousand fighting men, and even several of the sons of the pretender, left the city and surrendered. Mecca being thus left without defenders, Hajjāj took possession of it and invested the Ka'ba. At daybreak

of the 14th of Jomádi I. in the year 73 (October 1, 692.), the Omayyad troops made their way into the mosque. 'Abdalláh attacked them furiously, notwithstanding his advanced age, but at last fell, overwhelmed by numbers. His head was cut off, carried to Hajjáj, and sent by the victorious general to Damascus.

With Ibn Zobair perished the influence which the early companions of Mohammed had hitherto exercised over Islam. Medina and Mecca, though they continued to be the Holy Cities, had no longer the political importance which had enabled them to maintain a struggle with Damascus. Temporal interests, represented by Damascus, henceforth had precedence over those of religion; policy outweighed fanaticism; and the center of Islam, now permanently removed beyond the limits of Arabia, was more easily affected by foreign influences, and assimilated more readily their civilizing elements. Damascus, Cufa, and Basra attracted the flower of all the Moslem provinces; and thus that great intellectual, literary, and scientific movement which was to reach its apogee under the 'Abbásid Caliphs at Baghdád, became daily more marked.

By the death of the son of Zobair, 'Abd al-Melik remained sole Caliph; for Mohammed b. Hanafiya reckoned for nothing since the death of Mokhtár, whose creature he had been.

'Abd al-'Aziz having died in the year 84, 'Abd al-Melik chose as heirs of the empire, first his son Walid, and after him his second son Solaimán. He himself survived 'Abd al-'Aziz only two years, and died 14th Shawwál, 86 (October 8, 705), at the age of about sixty. His reign was one of the most unquiet in the annals of Islam, but also one of the most glorious. 'Abd al-Melik not only brought triumph to the cause of the Omayyads, but extended and strengthened the Moslem power externally. The most important achievement of Walid's reign was the conquest of Spain. The narrative of this conquest belongs specially to the history of SPAIN, (*q.v.*)

The Byzantine empire was disturbed by internal troubles during the years A.D. 715-717. Solaimán resolved to take advantage of these in order to rid himself forever of the hereditary enemy of Islam, and prepared a formidable expedition. A fleet of eighteen hundred vessels, equipped at Alexandria, sailed to the coasts of Asia Minor, took on board the Moslem army, commanded by Maslama, and transported it to Europe. This army appeared under the walls of Constantinople, August 15, 717, five months after Leo III., the Isaurian, had ascended the throne. Once more the Greek fire prevailed against the Moslems. Their fleet was destroyed by this terrible engine of war; the army could obtain no fresh supply of provisions, and suffered all the horrors of famine. Meanwhile the Caliph, who desired to be present in person at the taking of Constantinople, had set out to join the army. He fell ill at Dábik, not far from Aleppo, and died there on September 22, in the same year, after having nominated as his own successor his cousin, 'Omar b. 'Abd al-'Aziz, and as successor to the latter, Yazid b. 'Abd al-Melik, his own brother. In vain did the new Caliph dispatch from Egypt a fleet of four hundred ships to carry arms and provisions to the army before Constantinople; this fleet also was destroyed by the Greeks, and the Moslem army was decimated by famine, and soon by the plague as well. A hundred thousand men perished miserably under the walls of Constantinople, and Maslama brought back to Asia Minor a mere handful of soldiers, and that with great difficulty.

'Omar b. 'Abd al-'Aziz, incensed at this disaster, took his revenge on the Christians of his own states by excluding them from all public employments, in spite of

the great services they rendered there, and by loading them with intolerable imposts. By his religious intolerance, by the simplicity of his life, and by his vigor in observing the precepts of his religion and enforcing their observance, 'Omar has acquired in Moslem history the reputation of a saint. But the sanctity of a prince does not insure the greatness of a State; and the reign of 'Omar, as we shall see, was injurious rather than advantageous to Islam.

The 'Abbásid family derived its name from 'Abbás, who was Mohammed's uncle on the father's side, and who, during the prophet's life, had enjoyed universal consideration among the Moslems. It was he who, at the death of the Prophet, had the charge of washing the corpse. The first Caliphs, Abúbekr, 'Omar, 'Othmán, and 'Ali, showed the utmost deference to 'Abbás; and his eldest son 'Abdalláh had been united in the closest friendship with Hosain, the unfortunate son of 'Ali. After the assassination of 'Ali, and the slaughter of Hosain, 'Abdalláh had retired to Mecca, and there brought up his numerous family in hatred of the Omayyads. It was from his youngest son 'Ali, born A.H. 40, that the 'Abbásid dynasty sprang.

From the death of Merwán may be reckoned the real accession of the 'Abbásid dynasty to the Caliphate, which thus returned to the hands of the grand-nephews of the Prophet.

In the year 786 we reach the most celebrated name among the Arabian Caliphs, celebrated not only in the East, but in the West as well, where the stories of the Thousand and One Nights have made us familiar with that world which the narrators have been pleased to represent to us in such brilliant colors.

On the unexpected death of Hádí, the generals and ministers who had declared against Hárún, perceiving that popular favor did not incline to the son of the late Caliph, hastened to rally round the son of Khaizorán; and Áarún, surnamed Al-Rashíd (The Upright), ascended the throne without opposition. His first act was to choose as prime minister his former tutor, the faithful Yahyá b. Khálid, and to confide important posts to the sons of Yahyá, Fadl and Ja'far, the former of whom was also his own foster-brother. The Barmecide family were endued in the highest degree with those qualities of generosity and liberality which the Arabs prized so highly. Thus the chroniclers are never wearied in their praises of the Barmecides. Loaded with all the burdens of government, Yahyá brought the most distinguished abilities to the exercise of his office. He put the frontiers in a state of defense, and supplied all that was wanting for their security. He filled the public treasury, and carried the splendor of the throne to the highest point.

Although the administration of Hárún states was committed to skillful hands, yet the first years of his long reign were not free from troubles. Hárún in person invaded Asia Minor in the year 181 (A.D. 797-798), and during the following years his generals gained continual victories over the Byzantines, so that Irene was compelled to sue for peace. In the midst of the cares of war, Hárún did not forget his religious duties, and few years passed without his making the pilgrimage. In one of these pilgrimages, A.H. 186 (A.D. 802), he was accompanied by his two eldest sons, Mohammed and 'Abdalláh, and having determined to fix the order of succession in so formal a manner as to take away all pretext for future contentions, he executed a deed by which he appointed Mohammed his immediate heir; after him 'Abdalláh, and after 'Abdalláh a third of his sons, named Kásim. Mohammed received the surname of Al-Amín (The Sure), 'Abdalláh that of Al-Ma'mún (He in whom men trust), and Kásim that of

Mo'tamin billáh (He who trusts in God). **Hárún** further stipulated that Ma'mún should have as his share, during the lifetime of his brother, the government of the eastern part of the empire. Three years later disturbances broke out in Khorásán, where a certain Ráfi' b. Laith had revolted. Hárún set out for that province, accompanied by his son Ma'mún. It was to be his last journey. He was attacked by a tumor in the abdomen, and struggled in vain against this malady, which carried him off a year after his departure, A.H. 193 (A.D. 808-809), just on his arrival at the city of Tús, the birth-place of the great epic poet of Persia, Firdausi. Hárún was only forty-seven years of age. He was succeeded by his son Amin, who was killed in battle.

The reign of Ma'mún, another son of Hárún—that reign on which art, science, and letters, under the patronage of the Caliph, threw so brilliant a luster—had a very stormy beginning. Ma'mún was in no haste to remove to Baghdád, but continued to make Merv his temporary residence.

The duty of the Imám was to recite the public prayers in the mosque. He was appointed by the Caliph or his representatives, and chose in his turn his *Mo'edh-kíns*, who called the Faithful to prayer from the tops of the minarets.

The leadership of the yearly pilgrimage to the temple of Mecca was considered a great honor. It was almost always the Caliph himself or one of his near relatives who assumed the function of Amír al-Hajj.

This dynasty was followed by the Fatamite dynasty which reigned for nearly three centuries. From the date of the first crusade Baghdád ceases to have any special history. In 1258 it was taken by the Mongols under Jinghiz Khán and thus expired the Eastern Caliphate, which had lasted 626 years, from the death of Mohammed.

The Koran (Ko'rán) is the foundation of Islam. It is the sacred book of more than a hundred millions of men, some of them nations of immemorial civilization, by all whom it is regarded as the immediate word of God. And since the use of the Koran in public worship, in schools and otherwise, is much more extensive than, for example, the reading of the Bible in most Christian countries, it has been truly described as the most widely-read book in existence. This circumstance alone is sufficient to give it an urgent claim on our attention, whether it suit our taste and fall in with our religious and philosophical views or not. Besides, it is the work of Mohammed, and as such is fitted to afford a clue to the spiritual development of that most successful of all prophets and religious personalities. It must be owned that the first perusal leaves on a European an impression of chaotic confusion—not that the book is so very extensive, for it is not quite so large as the New Testament. This impression can in some degree be modified only by the application of a critical analysis with the assistance of Arabian tradition.

To the faith of the Moslems, as has been said, the Koran is the word of God, and such also is the claim which the book itself advances.

The rationale of revelation is explained in the Koran itself as follows: In heaven is the original text ("the mother of the book;," "a concealed book;," "a well-guarded tablet"). By a process of "sending down," one piece after another was communicated to the Prophet. The mediator was an angel, who is called sometimes the "Spirit," sometimes the "holy Spirit," and at a later time "Gabriel." This angel dictates the revelation to the Prophet, who repeats it after him, and afterward proclaims it to the world. It is plain that we have here a somewhat crude attempt of the Prophet to represent to himself the more or less unconscious process by

which his ideas arose and gradually took shape in his mind. It is no wonder if in such confused imagery the details are not always self-consistent.

It is an explicit statement of the Koran that the sacred book was revealed ("sent down") by God, not all at once, but piecemeal and gradually. This is evident from the actual composition of the book, and is confirmed by Moslem tradition. That is to say, Mohammed issued his revelations in fly-leaves of greater or less extent. A single piece of this kind was called either, like the entire collection, *ko'rán*, i. e. "recitation" or "reading;," or *kitáb*, "writing;," or *súra*, which is the late-Hebrew *shūrā*, and means literally "series." The last became, in the lifetime of Mohammed, the regular designation of the individual sections as distinguished from the whole collection; and accordingly it is the name given to the separate chapters of the existing Koran. These chapters are of very unequal length. Since many of the shorter ones are undoubtedly complete in themselves, it is natural to assume that the longer, which are sometimes very comprehensive, have arisen from the amalgamation of various originally distinct revelations. This supposition is favored by the numerous traditions which give us the circumstances under which this or that short piece, now incorporated in a larger section, was revealed; and also by the fact that the connection of thought in the present sūras often seems to be interrupted. And in reality many pieces of the long sūras have to be severed out as originally independent; even in the short ones parts are often found which cannot have been there at first.

How these revelations actually arose in Mohammed's mind is a question which it is almost as idle to discuss as it would be to analyze the workings of the mind of a poet. In his early career, sometimes perhaps in its later stages also, many revelations must have burst from him in uncontrollable excitement, so that he could not possibly regard them otherwise than as divine inspirations. We must bear in mind that he was no cold systematic thinker, but an Oriental visionary, brought up in crass superstition, and without intellectual discipline; a man whose nervous temperament had been powerfully worked on by ascetic austerities, and who was all the more irritated by the opposition he encountered, because he had little of the heroic in his nature. Filled with his religious ideas and visions, he might well fancy he heard the angel bidding him recite what was said to him.

How the various pieces of the Koran took literary form is uncertain. Mohammed himself, so far as we can discover, never wrote down anything. The question whether he could read and write has been much debated among Moslems, unfortunately more with dogmatic arguments and spurious traditions than authentic proofs. At present, one is inclined to say that he was not altogether ignorant of these arts, but that from want of practice he found it convenient to employ some one else whenever he had anything to write. After the flight to Medina (A.D. 622) we are told that short pieces—chiefly legal decisions—were taken down immediately after they were revealed, by an adherent whom he summoned for the purpose; so that nothing stood in the way of their publication. Hence it is probable that in Mecca, where the art of writing was commoner than in Medina, he had already begun to have his oracles committed to writing. That even long portions of the Koran existed in written form from an early date may be pretty safely inferred from various indications; especially from the fact that in Mecca the Prophet had caused insertions to be made, and pieces to be erased in his previous revelations.

MOHI, JULES, Orientalist, was born at Stuttgart in 1800, and died in 1876.

MÖHLER, JOHANN ADAM, Roman Catholic theologian, was born at the village of Igersheim in Württemberg on May 6, 1796, and died in 1836.

MOHR, KARL FRIEDRICH, a philosopher whose greatest claims to scientific distinction are as yet, though indubitable, only partially admitted, was the son of a well-to-do druggist in Coblenz, and was born November 4, 1806. Although he stood at the very head of the scientific pharmacists of Germany, his name was deliberately omitted from the list of the commission entrusted with the preparation of the *Pharmacopœia Germanica*. Yet in that work many of his ideas and processes were incorporated by the very men who had previously denounced them. He died in October, 1879.

MOIR, DAVID MACBETH, the "Delta" of *Blackwood's Magazine*, one of its most popular contributors in its early days, was born at Musselburgh, January 5, 1798, and was a physician in active practice there from his manhood to his death (July 6, 1851).

MOIR, GEORGE, author of the treatises on "Poetry," and "Romance" in the seventh edition of the *Encyclopædia Britannica*, and born at Aberdeen in 1800, was an Edinburgh lawyer of very varied accomplishments. He died in 1870.

MOISSAC, chief town of an arrondissement in the department of Tarn-et-Garonne, France, is situated on the right bank of the Tarn, and on the railway line from Bordeaux to Cette, seventeen miles west-northwest of Montauban.

MOKADDASÍ. Shams al-Dín Abú Abdalláh Mohammed ibn Ahmad al-Mokaddasí, i.e., of Jerusalem, also called al-Bashshari, was the author of a famous description of the land of Islam, which much surpasses the earlier works of the same kind. His first pilgrimage was made at the age of twenty, but his book was not published till A.H. 375 (985-6 A.D.), when he was forty years old.

MOKSHAN, a town of Russia, situated in the government of Penza, twenty-seven miles to the northwest of the capital of the province, and eighteen miles from the Ranzay railway station. It has 14,500 inhabitants, who are engaged in agriculture, or work in flour-mills, oil-works, tanneries, and potash-works.

MOLA, or MOLA DI BARI, a seaport town of Italy, in the province of Bari, thirteen miles from Bari on the railway to Brindisi. Population, 12,435

MOLASSES. See SUGAR.

MOLAY JACQUES DE, a native of Burgundy, became grand-master of the order of the Temple in 1298, and was the last who held that dignity. He was burned at the stake in 1314. (See TEMPLARS.)

MOLDAVIA. See ROMANIA.

MOLE (contracted form of mold-warp, i.e., mold-caster), a term restricted in England to the common mole (*Talpa europæa*), a small, soft-furred, burrowing mammal, with minute eyes, and broad fossorial fore feet, belonging to the order *Insectivora* and family *Talpidae*, but generally applied elsewhere to any underground burrowing animal of the class Mammalia.

Talpa europæa, the Common Mole, type of the genus *Talpa*, is about six inches in length, of which the tail measures somewhat more than an inch; the body is long and cylindrical, and, owing to the very anterior position of the forelimbs, the head appears to rest between the shoulders; the muzzle is long and obtusely pointed, terminated by the nostrils, which are close together in front; the minute eye is almost hidden by the fur; the ear is without a conch, opening on a level with the surrounding integument; the forelimbs are rather short and very muscular, terminating in broad, naked, shovel-shaped feet, the palms normally directed out-

ward, each with five subequal digits armed with strong flattened claws; the hind-feet, on the contrary, are long and narrow, and the toes are provided with slender claws. The body is densely covered with soft, erect, velvety fur—the hairs uniform in length and thickness, except on the muzzle and short tail, the former having some straight vibrissæ on its sides, while the latter is clothed with longer and coarser hairs. The fur is generally black, with a more or less grayish tinge, or brownish-black, but various paler shades up to pure white have been observed.

The food of the mole consists chiefly of the common earth-worm, in pursuit of which it forms its well-known underground excavations.

The sexes come together about the second week in March, and the young—generally from four to six in number—which are brought forth in about six weeks, quickly attain their full size.

MOLECULE. In the conception of the atomic as opposed to the continuous and infinitely divisible constitution of matter, it is supposed that portions of matter called atoms exist, which are separated, or are capable of being separated, from each other by empty space. (See ATOM). It may be the case that each atom has unchangeable shape and volume as well as unchangeable mass, but such a conception of an atom is not essential to the hypothesis. It is not even necessary to maintain that no part of space can be in two atoms at the same time. But one attribute of the atom upon which its permanence, or, so to speak, its personal identity, depends, is its constituent mass, and this remains the same, unchanged and unchangeable, through all time.

Boscovich, indeed, goes so far as to regard the atom as a mere center of force, the result of whose existence is that no two atoms or centers can approach each other within a certain distance, while other physicists regard the atomic volume as a distinct portion of space occupied by that atom to the exclusion of every other, and comprising within it matter ideally infinitely divisible, but the parts of which in fact never can be separated from each other. In this latter mode of viewing the subject, all the conclusions of mechanics which are based on the conception of the continuity and infinite divisibility of matter may be applied to the equilibrium or motion of each individual atom, the atomic theory merely introducing the additional hypothesis that, in fact, these persistent entities called atoms do exist, and that out of them all substances which affect our senses are constructed. The theory of universal gravitation requires us to believe in the existence of force or actions between every portion of matter and every other portion, determinate in magnitude and direction, and such that, when on the infinitely divisible hypothesis the volumes of these portions are indefinitely diminished, these mutual forces are inversely proportional to the square of the distance between the portions (the distance between any two points, one in the volume of each portion, being in this case taken as the distance between the portions), and directly proportional to the products of the masses, or quantities of the two portions of matter—such forces being regarded provisionally as ultimate facts, while inviting further analysis and explanation. Chemical and chemico-physical investigations indicate the existence of other actions between portions of matter, following other and for the most part unknown laws, and rapidly becoming inappreciable as the distance between the reacting portions is increased. All these hypotheses are to be retained on the hypothesis of discrete atoms as above enunciated, the mutual actions between atoms being the resultant of the actions between the various portions of

their constituent matter. The volumes of the atoms are so small that, for any sensible distances apart, the line of the resultant mutual action between them may be taken as coincident with the line joining any point in the volume of one to any point in the volume of the other, but, for distances or parts comparable with the linear dimensions of the atoms, the size and shape of their bounding surfaces must be taken into consideration, and perhaps also the law of distribution of their constituent matter within that surface. In all respects, unless we accept the Boscovichian hypothesis, we simply regard the atom as made up, so to speak, of infinitely divisible matter, while substances, as we know them, are built up of indestructible and unchangeable atoms.

With this conception of an atom, as thus explained, we might be content to rest, confessing our total ignorance of the mode in which such atoms are built up into actual substances, being satisfied to regard such substances as composed of these distinct portions of matter separated, or capable of being separated, by empty space from other portions. But the molecular hypothesis of the constitution of different kinds of substances aims at analyzing this process by which such substances are built up out of their constituent atoms. The *molecule* of any substance is, by some chemists, defined as being the smallest portion of that substance to which can be attributed all the chemical properties of the substance; by others, as the smallest portion which, so long as the substance is chemically unchanged, keeps together without complete separation of its parts. In the language of Clausius' theorem, if the parts of the molecule have internal motion, the kinetic energy of such internal motion is equal to the virial of the mutual attractive forces of the parts. Thus the formation of the molecule of each particular substance is viewed as an essential step in the process of building up that substance out of its constituent atoms. The molecule is first built up out of atoms arranged in its formation according to a definite type, and then the substance itself is constituted of these molecules. Of course molecules may be, and in fact in many particular substances are, supposed to be monatomic; that is to say, the intermediate step of building up the molecule out of the atoms has, in these particular substances, been omitted, the atoms and molecules becoming then identical. The particular arrangement of the formed molecules in the building up of the substance determines the physical state of that substance—that is, its fluid, solid, gaseous, crystalline, or amorphous state; but the chemical properties of the substance depend upon the constitution of the molecule. As the investigations and theories of chemistry appear to indicate irresistibly the existence of permanent atoms, so do they also lead almost as necessarily to the conception of the molecule as an entity which bears the same relation to special substances that the atoms bear to matter generally. So long as the molecule endures, the substance of which it is the molecule retains its chemical properties; with the dissolution of the molecule, the substance, as that special substance, perishes; the atoms alone continue, and are free to enter into other combinations. The permanence of the molecule is relative, that of the atom absolute. This conception of the molecular constitution of substances suggests physical questions of great interest, such as the shape, volume, and mass of the constituent molecules, and the relative motions of which their parts are susceptible; and the answers to these questions cannot fail to be of great value in chemical and chemico-physical investigations, as well as in the theories of light and electricity.

Now, whatever differences may exist between the

properties of different substances in the solid and liquid states, there are certain properties which, in the gaseous state, manifest themselves with no variation whatever in all substances alike. Hence the explanation of these common properties—or gaseous laws, as they are called—has long possessed a peculiar fascination for physicists. The tendency to expand or fill all accessible space, manifested by all gases, proves that on the molecular hypothesis their compound atoms or molecules must be continually tending to fly apart. We must conceive gases as constituted of molecules, not only separable but actually separated by space void of the matter of which these gases consist; and it may be most reasonably expected, therefore, that any general laws to which substances in this state conform may afford us a valuable insight into the constitution of these separate molecules.

Now the general laws to which all gases conform are: (1) *Boyle's law*—that, in a given mass of any gas kept at constant temperature, the pressure per unit of area upon the containing surface increases in the same proportion as the volume occupied by the gas is diminished, or at least with very slight deviation from exact proportionality; (2) *Charles' law*—that if the temperature be varied while the pressure upon the gas remains the same, the gas increases by $\frac{1}{273}$ of its volume at zero centigrade for every degree of centigrade added to the temperature, or, which in common with Boyle's law is the same thing, that if the density be constant, the pressure is directly proportional to the temperature measured from the point -273° centigrade, this point being called the zero of absolute temperature; (3) *Avogadro's law*—which asserts that all gases at the same temperature and pressure contain the same number of molecules in the same volume; and (4) *Dalton's law*—that in a mixture of different gases, when there is equilibrium, each gas behaves as a vacuum to all the rest.

It was at one time considered that these phenomena might be explained on the hypothesis of mutual repulsive forces between the parts of which the gas is composed, whether they were regarded as constituted of molecules or of infinitely divisible continuous matter, but it has been shown in the article ATOM that there are at least two absolutely conclusive reasons why this explanation cannot be accepted. These objections, together with the experimental fact proved by Joule that gases, or at any rate atmospheric air, expand into vacuum with scarcely any appreciable change of temperature, must be considered fatal to any mutual-force theory of gaseous action, and accordingly, physicists have been driven to seek for other methods of explaining these laws. The explanation which has been more developed than any other is that known as the kinetic theory of gases, which regards the intrinsic energy of a gaseous mass as residing, not in the potential energy of intermolecular forces, but mainly in the kinetic energy of the molecules themselves, which are assumed to be in a state of continual relative velocity, admitting at the same time a possible small intermolecular potential energy, and it may be also an interatomic energy between the atoms of the individual molecules. That some such persistent relative motion does exist in every gaseous mass is evident from the rapidity with which odors penetrate the stillest air where no breath of wind—that is, of absolute motion of translation of the mass as a whole or any portion of finite size—is perceptible. It becomes an interesting question whether the laws of mechanics admit of a mass thus constituted ever arriving at a state of permanence; that is to say, whether consistently with the hypothesis of infinite irregularities in the directions and magnitudes of velocities of individual molecules, there may be found any properties of the

mass in the aggregate which remain constant, and in agreement with the accepted laws common to all gases. Now the physical theory of heat compels us to regard the intrinsic energy of any gaseous mass as dependent entirely or almost entirely upon the temperature. If, therefore, this intrinsic energy is to be sought for in the kinetic energy of the moving molecules, it follows that the average value of the kinetic energy of the molecules taken throughout the mass must be also a function of the temperature.

Many attempts have been made in recent years to form an estimate or conjecture, more or less accurate, of the numerical value of the dimensions of a molecule and the absolute force between molecules.

It is first necessary to define what is meant by the dimensions of a molecule. Regarded as an elastic sphere, it has dimensions with the conception of which we are familiar. It is not, of course, seriously contended by any physicists that the molecules of a gas are actually hard elastic spheres, exerting no force on each other at any distance greater than that of actual contact, and then an infinite force. It is necessary to conceive the forces as finite, although they may diminish so rapidly with the distance as that the motions of molecules in the aggregate differ little from what they would be if the molecules were ideal elastic spheres. Nevertheless, they must be finite forces; and that being the case, it is difficult, if not impossible, to frame a definition of the boundary of a molecule, except as a certain surface at which the forces acting between the molecule in question and other molecules attain a certain value.

The word *Molecule* is used by chemists to express the unit of a pure substance, that quantity of it which its formula ought to represent. What this quantity is in any particular case, must be ascertained by studying the chemical actions by which the substance is produced and the chemical changes which it undergoes.

The formula usually assigned to acetic acid is $C_2H_4O_2$. This agrees with almost all the chemical actions in which it takes part. Thus, one quarter of the hydrogen is replaceable by other metals, as in $C_2H_3KO_2$, etc.; and one, two, or three quarters of the hydrogen can be replaced by chlorine. There must, therefore, be two (or a multiple of four) atoms of hydrogen in the molecule. Similarly, half of the oxygen can be replaced by sulphur, and one-half of the oxygen along with one-quarter of the hydrogen can be replaced by chlorine. There must, therefore, be two (or a multiple of two) atoms of oxygen in the molecule. Again, the formation of marsh gas and carbonate of soda, when acetate of soda is heated with caustic soda, and the formation of aceto-nitrile from cyanide of potassium and iodide of methyl, show that the carbon in acetic acid is divisible by two, or that the molecule contains two (or a multiple of two) atoms of carbon. $C_2H_4O_2$ is the simplest formula which fulfills these conditions, but the existence of an acid acetate of potash and an acid acetate of ammonia, the formulæ of which are usually written $C_2H_3KO_2$, $C_2H_4O_2$ and $C_2H_3(NH_4)O_2$, $C_2H_4O_2$, as if these were compounds derived from two molecules of acetic acid, might lead us to $C_4H_8O_4$, as this shows that the hydrogen is divisible by eight. In the same way we can easily satisfy ourselves that $C_6H_{10}O_5$, or some multiple of it, is the formula of starch, that C_8H_5NO , or some multiple of it, is the formula of indigo blue, and so on.

MOLESKIN is a stout heavy cotton fabric of leathery consistence woven as a satin twill on a strong warp. It is finished generally either as a bleached white or as a slaty drab color, but occasionally it is printed in imitation of tweed patterns. Being an exceedingly durable and economical texture, it was formerly much more worn by workmen, especially outdoor laborers,

than is now the case. It is also used for gun-cases, carriage-covers, and several purposes in which a fabric capable of resisting rough usage is desirable.

MOLESWORTH, SIR WILLIAM, the eighth baronet, was born in London, May 23, 1810, and succeeded to the extensive family estates in Devon and Cornwall in 1823. From 1837 to 1841 Sir William Molesworth sat for the borough of Leeds, and during those years acquired considerable influence in the House of Commons by his speeches and by his tact in presiding over the select committee on Transportation. From 1841 to 1845 he remained in private life, occupying his leisure time in editing the works in Latin and English of Thomas Hobbes of Malmesbury, a recreation which cost him no less than \$30,000. In the latter year he was returned for the borough of Southwark, and retained that seat until his death. In July, 1855, he was called to preside over the Colonial Office, but unfortunately its duties were no sooner intrusted to his care than he was cut off by death (October 22, 1855).

MOLFETTA, a city and seaport of Italy, in the province of Bari, sixteen miles by rail north-northwest of Bari. From the sea it presents a fine appearance with its white stone houses and the remains of its turreted walls; and there are several buildings of considerable pretensions. The population is 27,000.

MOLIÈRE, to give Jean Baptiste Poquelin the stage name which he chose, for some undiscovered reason, to assume, was born in Paris, probably in January, 1622. He was entered at the College of Clermont, where, among more serious studies, the Jesuit fathers encouraged their pupils to take part in *ballets*, and in later life Molière was a distinguished master of this sort of entertainment. According to Grimarest, the first writer who published a life of Molière in any detail (1705), he not only acquired "his humanities," but finished his "philosophy" in five years. He left the Collège de Clermont in 1641, the year when Gassendi, a great contemner of Aristotle, arrived in Paris. His college education over, Molière studied law, and there is even evidence—that of tradition in Grimarest, and of Le Boulanger de Chalusay, the libelous author of a play called *Élémire Hypochondre*—to prove that he was actually called to the bar. More trustworthy is the passing remark in La Grange's short biography (1682), "*au sortir des écoles droit, il choisit la profession de comédien.*" Before joining a troop of half-amateur comedians, however, Molière had some experience in his father's business. In 1637 his father had obtained for him the right to succeed to his own office as "valet tapissier de chambre du roi." When the king traveled the valet tapissier accompanied him to arrange the furniture of the royal quarters. There is very good reason to believe that Molière accompanied Louis XIII. as his valet tapissier to Province in 1642. It is even not impossible that Molière was the young valet de chambre who concealed Cinq Mars just before his arrest at Narbonne, June 13, 1642. But this is part of the romance rather than of the history of Molière. Our next glimpse of the comedian we get in a document of January 6, 1643. Molière acknowledges the receipt of money due to him from his deceased mother's estate, and gives up his claim to succeed his father as "valet de chambre du roi." On December 28th of the same year we learn, again from documentary evidence, that Jean Baptiste Poquelin, with Joseph Bédard, Madeleine Bédard, Geneviève Bédard, and others, have hired a tennis-court, and fitted it up as a stage for dramatic performances. The company called themselves *L'illustre Théâtre, illustre* being then almost a slang word, very freely employed by the writers of the period.

Molière's connection with the family of Bédard brought him much unhappiness. The father of this family,

Joseph Béjard the elder, was a needy man with eleven children at least. His wife's name was Marie Hervé. The most noted of his children, companions of Molière, were Joseph, Madeleine, Geneviève, and Armande. Of these, Madeleine was a woman of great talent as an actress, and Molière's friend, or perhaps mistress, through all the years of his wanderings. Now, on February 14, 1662 (for we must here leave the chronological order of events), Molière married Armande Claire Élizabeth Grésinde Béjard. His enemies at that time, and a number of his biographers in our own day, have attempted to prove that Armande Béjard was not the sister, but the daughter of Madeleine, and even that Molière's wife may have been his own daughter by Madeleine Béjard. All the arguments in support of this abominable theory are based on reckless and ignorant confusions, and do not deserve criticism.

To return to the order of events, Molière passed the year 1643 in playing with, and helping to manage, the Théâtre Illustre. The company acted in various tennis-courts, with very little success. Molière was actually arrested by the tradesman who supplied candles, and the company had to borrow money from one Aubrey to release their leader from the Grand Châtelet (August 13, 1645). The process of turning a tennis-court into a theater was somewhat expensive, even though no seats were provided in the pit. The troop was for a short time under the protection of the duc d'Orléans, but his favors were not lucrative. The duc de Guise, according to some verses printed in 1646, made Molière a present of his cast-off wardrobe. But costume was not enough to draw the public to the tennis-court theater of the Croix Noire, and empty houses at last obliged the Théâtre Illustre to leave Paris at the end of 1646.

Molière now determined to play among the rural towns. The career of a strolling player is much the same at all times and in all countries. Perrault tells us what the arrangements of the theater were in Molière's early time. Tapestries were hung round the stage, and entrances and exits were made by struggling through the heavy curtains, which often knocked off the hat of the comedian, or gave a strange cock to the helmet of a warrior or a god. The lights were candles stuck in tin sconces at the back and sides, but luxury sometimes went so far that a chandelier of four candles was suspended from the roof. At intervals the candles were let down by a rope and pulley, and any one within easy reach snuffed them with his fingers. A flute and tambour, or two fiddlers, supplied the music. The highest prices were paid for seats in the *dedans* (cost of admission 10 cents); for the privilege of standing up in the pit 5 cents was the charge. The doors were opened at one o'clock, the curtain rose at two.

The nominal director of the Théâtre Illustre in the provinces was Du Fresnoy; the most noted actors were Molière, the Bèjards, and Du Parc, called Gros René. It is extremely difficult to follow exactly the line of march of the company. They played at Bordeaux, for example, but the date of this performance, when Molière (according to Montesquieu) failed in tragedy and was pelted, is variously given as 1644-45 (Trallage), 1647 (Loiseleur), 1648-58 (Lacroix). We find Molière at Nantes in 1648, at Fontenay-le-Compte, and in the spring of 1649 at Agen, Toulouse, and probably at Angoulême and Limoges. In January, 1650, they played at Narbonne, and between 1650 and 1653 Lyons was the headquarters of the troupe. In January, 1653, or perhaps 1655, Molière gave *L'Etourdi* at Lyons, the first of his finished pieces as contrasted with the slight farces with which he generally diverted a country audience. At Lyons De Brie and his wife, the famous Mlle. de Brie, entered the troupe, and Du Parc married Mar-

quise de Gorla, better known as Mlle. du Parc. Molière's own opinion of the ladies and men of his company may be read between the lines of his *Impromptu de Versailles*. In 1653 Prince de Conti, after many political adventures, was residing at La Grange, near Pézénas, in Languedoc, and chance brought him into relations with his old schoolfellow Molière. Conti had for first gentleman of his bedchamber the abbé Daniel de Cosnac, whose memoirs now throw light for a moment on the fortunes of the wandering troupe. Cosnac engaged the company "of Molière and of La Béjart;" but another company, that of Cormier, nearly intercepted the favor of the prince. Thanks to the resolution of Cosnac, Molière was given one chance of appearing on the private theater of La Grange. The excellence of his acting, the splendor of the costumes, and the insistence of Cosnac, and of Sarrasin, Conti's secretary, gained the day for Molière, and a pension was assigned to his company. As Cosnac proposed to pay Molière a thousand crowns of his own money to recompense him in case he was supplanted by Cormier, it is obvious that his profession had become sufficiently lucrative. In 1654, during the session of the estates of Languedoc, Molière and his company played at Montpellier. Here Molière danced in a ballet (*Le Ballet des Incompatibles*) in which a number of men of rank took part, according to the fashion of the time. Molière's own rôles were those of the Poet and the Fish-wife. The sport of the little piece is to introduce opposite characters, dancing and singing together. Silence dances with six women, Truth with four courtiers, Money with a poet, and so forth. Whether the ballet or any part of it is by Molière is still disputed.

In April, 1655, it is certain that the troupe was at Lyons, where they met and hospitably entertained a profligate buffoon, Charles d'Assoucy, who informs the ages that Molière kept open house, and "*une table bien garnie*." November, 1655, found Molière at Pézénas, where the estates of Languedoc were convened, and where local tradition points out the barber's chair in which the poet used to sit and study character. The longest of Molière's extant autographs is a receipt, dated at Pézénas, February 4, 1656, for 6,000 livres, granted by the estates of Languedoc. This year was notable for the earliest representation, at Béziers, of Molière's second finished comedy, the *Dépit Amoureux*. Conti now withdrew to Paris, and began to "make his soul," as the Irish say. Almost his first act of penitence was to discard Molière's troupe (1657), which consequently found that the liberality of the estates of Languedoc was dried up forever. Conti's relations with Molière must have definitely closed long before 1666, when the now pious prince wrote a treatise against the stage, and especially charged his old schoolfellow with keeping a new school, a school of atheism. Molière was now (1657) independent of princes and their favor. He went on a new circuit to Nismes, Orange, and Avignon, where he met another old classmate, Chapelle, and also encountered the friend of his later life, the painter Mignard. After a later stay at Lyons, ending with a piece given for the benefit of the poor on February 27, 1658, Molière passed to Grenoble, returned to Lyons, and is next found in Rouen, where, we should have said, the Théâtre Illustre had played in 1643. At Rouen Molière must have made or renewed the acquaintance of Pierre and Thomas Corneille. His company had played pieces by Corneille at Lyons and elsewhere. The real business of the comedian in Rouen was to prepare his return to Paris. After several secret journeys thither he was fortunate enough to secure the patronage of Monsieur, the king's only brother, who granted him his protection.

and permitted the company to take his name, presenting them as his servants to the king and the queen-mother. The troupe appeared for the first time before Louis XIV. in a theater arranged in the old Louvre (October 24, 1658).

Molière was now thirty-six years of age. He had gained all the experience that fifteen years of practice could give. He had seen men and cities, and noted all the humors of rural and civic France. He was at the head of a company which, as La Grange, his friend and comrade, says, "sincerely loved him." He had the un-lucrative patronage of a great prince to back him, and the jealousy of all play-wrights, and of the old theaters of the Hôtel de Bourgogne and the Marais, to contend against.

The first appearance of Molière before the king was all but a failure. *Nicomède*, by the elder Corneille, was the piece, and we may believe that the actors of the Hôtel de Bourgogne, who were present, found much to criticise. When the play was over, Molière came forward and asked the king's permission to act "one of the little pieces with which he had been used to regale the provinces." The *Docteur Amoureux*, one of several slight comedies admitting of much "gag," was then performed, and "diverted as much as it surprised the audience." The king commanded that the troupe should establish itself in Paris. The theater assigned to the company was a *salle* in the Petit Bourbon, in a line with the present Rue du Louvre. The first piece played in the new house (November 3, 1658), was *L'Étourdi*. La Grange says the comedy had a great success, producing seventy pistoles for each actor.

The next piece, new in Paris, though not in the provinces, was the *Dépit Amoureux* (first acted at Béziers, 1656). The play was not less successful than *L'Étourdi*. "Nothing so good," says Mr. Saintsbury, "had yet been seen on the French stage, as the quarrels and reconciliations of the quartette of master, mistress, valet, and soubrette." The same praise was given, perhaps even more deservedly, to *Les Précieuses Ridicules* (November 18, 1659). Doubts have been raised as to whether this famous piece, the first true comic satire of contemporary foibles on the French stage, was a new play. La Grange calls it *pièce nouvelle* in his *Registre*, but, as he enters it as the third *pièce nouvelle*, he may only mean that, like *L'Étourdi*, it was new to Paris. The success of the *Précieuses Ridicules* was immense; on one famous occasion the king was a spectator, leaning against the great chair of the dying Cardinal Mazarin. The play can never cease to please while literary affectation exists, and it has a comic force of deathless energy. Yet a modern reader may spare some sympathy for the poor heroines, who do not wish, in courtship, to "begin with marriage," but prefer first to have some less formidable acquaintance with their wooers. Molière's next piece was less important, and more purely farcical, *Sganarelle; ou le Cocu Imaginaire* (May 28, 1660).

On October 11, 1660, the Théâtre du Petit Bourbon was demolished by the superintendent of works, without notice given to the company. The king gave Molière the Salle du Palais Royal, but the machinery of the old theater was maliciously destroyed. Meanwhile the older companies of the Marais and the Hôtel de Bourgogne attempted to lure away Molière's troupe, but, as La Grange declares, "all the actors loved their chief, who united to extraordinary genius an honorable character and charming manner, which compelled them all to protest that they would never leave him, but always share his fortunes." While the new theater was being put in order, the company played in the houses of the great, and before the king at the Louvre. In

their new house (originally built by Richelieu) Molière began to play on January 20, 1661. Molière now gratified his rivals by a failure. *Don Garcie de Navarre*, a heavy tragi-comedy, which had long lain among his papers, was first represented on February 4, 1661. Either Molière was a poor actor outside comedy, or his manner was not sufficiently "stagy," and, as he says, "demoniac," for the taste of the day. His opponents were determined that he could not act in tragi-comedy, and he, in turn, burlesqued their pretension and exaggerated manner in a later piece.

The subject of this unsuccessful drama is one of many examples which show how Molière's mind was engaged with the serious or comic aspects of jealousy, a passion which he had soon cause to know most intimately. Meantime the everyday life of the stage went on, and the doorkeeper of the Théâtre St. Germain was wounded by some revelers who tried to force their way into the house. A year later, an Italian actor was stabbed in front of Molière's house, where he had sought to take shelter. To these dangers actors were peculiarly subject. Molière himself was frequently threatened by the marquises and others whose class he ridiculed on the stage, and there seems even reason to believe that there is some truth in the story of the angry marquis who rubbed the poet's head against his buttons, thereby cutting his face severely. Before Easter, Molière asked for two shares in the profits of his company, one for himself, and one for his wife, if he married. That fatal step was already contemplated. On June 24th he brought out for the first time *L'École des Maris*. It is significant of Molière's talent that the grotesque and baffled paternal wooer, "Sganarelle," like several other butts in Molière's comedy, does to a certain extent win our sympathy and pity as well as our laughter. The next new piece was *Les Fâcheux*, a *comédie-ballet*, the Comedy of Bored, played before the king at Fouquet's house at Vaux le Vicomte (August 15-20, 1661). In the dedication to the king Molière says that Louis suggested one scene (that of the Sportsmen), and in another place he mentions that the piece was written, rehearsed, and played in a fortnight. The fundamental idea of the play, the interruptions by bores, is suggested by a satire of Régnier's, and that by a satire of Horace.

In February, 1662, Molière married Armande Béjard. The hideous accusation brought by the actor Montfleury, that Molière had married his own daughter, Louis XIV. answered by becoming the godfather of Molière's child. The king, indeed, was a firm friend of the actor; and, when Molière was accused of impiety on the production of *Don Juan* (1665), Louis gave him a pension. We need not try to make Madame Molière a *vertu*, as French ladies of the theater say, but it is certain that the charges against her are unsubstantiated.

From 1662 onward Molière suffered the increasing hatred of his rival actors. On December 26th was played for the first time the admirable *École des Femmes*, which provoked a literary war, and caused a shower of "paper bullets of the brain." The innocence of Agnes was called indecency; the sermon of Arnolphe was a deliberate attack on Christian mysteries. We have not the space to discuss the religious ideas of Molière; but both in *L'École des Femmes* and in *Don Juan* he does display a bold contempt for the creed of "boiling chaldrons" and of a physical hell.

Molière's next piece was *Le Mariage Forcé* (February 15, 1664), a farce with a ballet. The comic character of the reluctant bridegroom excites contemptuous pity, as well as laughter. From the end of April till May 22d the troupe was at Versailles, acting among the picturesque pleasures of that great festival of the king's. The *Princesse d'Élide* was acted for the first time, and

the first three acts of *Tartuffe* were given. Molière's natural hatred of hypocrisy had not been diminished by the charges of blasphemy which were showered on him after the *École des Femmes*. *Tartuffe* made enemies everywhere. Jansenists and Jesuits, like the two marquises in *L'Impromptu de Versailles*, each thought the others were aimed at. Five years passed before Molière got permission to play the whole piece in public. In the interval it was acted before Madame, Condé, the legate, and was frequently read by Molière in private houses. The *Gazette* of May 17, 1664 (a paper hostile to Molière), says that the king thought the piece inimical to religion. Louis was not at that time on good terms with the *dévôts*, whom his amours scandalized; but, not impossibly, the queen-mother (then suffering from her fatal malady) disliked the play. A most violent attack on Molière, "that demon clad in human flesh," was written by one Pierre Roullé (*Le Roy Glorieux au Monde*, Paris, 1664). This fierce pamphlet was suppressed, but the king's own copy, in red morocco with the royal arms, remains to testify to the bigotry of the author, who was curé of Saint Barthélemy. According to Roullé, Molière deserved to be sent through earthly to eternal fires. The play was prohibited, as we have seen, but in August, 1665, the king adopted Molière's troupe as his servants, and gave them the title of "troupe du roy." This, however, did not cause Molière to relax his efforts to obtain permission for *Tartuffe*, and his perseverance was at length successful. That his thoughts were busy with contemporary hypocrisy is proved by certain scenes in one of his greatest pieces, the *Festin de Pierre*, or *Don Juan* (February 15, 1665). The legend of *Don Juan* was familiar already on the Spanish, Italian, and French stages. Molière made it a new thing: terrible and romantic in its portrait of *un grand seigneur mauvais homme*, modern in its suggested substitution of *la humanité* for religion, comic, even among his comedies, by the mirthful character of "Sganarelle." The piece filled the theater, but was stopped, probably by authority, after Easter. It was not printed by Molière, and even in 1682 the publication of the full text was not permitted. Happily the copy of De la Regnie, the chief of the police, escaped obliterations, and gave us the full scene of "Don Juan" and the "Beggar." The piece provoked a virulent criticism (*Observations sur le Festin de Pierre*, 1665). It is allowed that Molière has some farcical talent, and is not un-killed as a plagiarist, but he "attacks the interests of Heaven," "keeps a school of infidelity," "insults the king," "corrupts virtue," "offends the queen-mother," and so forth. Two replies were published, one of which is by some critics believed to show traces of the hand of Molière. The king's reply, as has been shown, was to adopt Molière's company as his servants, and to pension them. *L'Amour Médecin*, a light comedy, appeared September 22, 1665. In this piece Molière, for the second time, attacked physicians. In December there was a quarrel with Racine about his play of *Alexandre*, which he treacherously transferred to the Hôtel de Bourgogne. June 4, 1666, saw the first representation of that famous play, *Le Misanthrope* (ou *L'Atrabilaire Amoureux*, as the original second title ran). This piece, perhaps the masterpiece of Molière, was more successful with the critics, with the court, and with posterity than with the public.

A briefer summary must be given of the remaining years of the life of Molière. The attractions of *Le Misanthrope* were reinforced (August 6th) by those of the *Médecin Malgré Lui*, an amusing farce founded on an old *fabliau*. In December the court and the comedians went to Saint Germain, where, among other di-

versions, the pieces called *Mélicerte*, *La Pastorale Comique* (of which Molière is said to have destroyed the MS.), and the charming little piece *Le Sicilien*, were performed. A cold and fatigue seem to have injured the health of Molière, and we now hear of the consumptive tendency which was cruelly ridiculed in *Élomire Hypochondre*. Molière was doubtless obliged to see too much of the distracted or pedantic physicians of an age when medicine was the battlefield of tradition, superstition, and nascent chemical science. On April 17, 1667, Robinet, the rhyming gazetteer, says that the life of Molière was thought to be in danger. On June 10th, however, he played in *Le Sicilien* before the town. In the earlier months of 1667 Louis XIV. was with the army in Flanders. There were embassies sent from the comedy to the camp, and, on August 5th, it was apparent that Molière had overcome the royal scruples. *Tartuffe* was played, but Lamoignon stopped it after the first night. La Grange and La Torillière hastened to the camp, and got the king's promise that he would reconsider the matter on his return. Molière's next piece (January 13, 1668) was *Amphitryon*, a free—a very free—adaptation from Plautus, who then seems to have engaged his attention, for not long afterward he again borrowed from the ancient writer in *L'Avare*. There is a controversy as to whether *Amphitryon* was meant to ridicule M. de Montespan, the husband of the new mistress of Louis XIV. Michelet has a kind of romance based on this probably groundless hypothesis. The king still saw the piece occasionally, after he had purged himself and forsworn sack under Madame de Maintenon, and probably neither he nor that devout lady detected any personal references in the coarse and witty comedy. As usual, Molière was accused of plagiarizing, this time from Rotrou, who had also imitated Plautus. The next play was the immortal *George Dandin* (July 10th), first played at a festival at Versailles. Probably the piece was a rapid palimpsest on the ground of one of his old farces, but the addition of these typical members of a county family, the De Sotenville, raises the work from farce to satiric comedy. The story is borrowed from Boccaccio, but is of unknown age, and always new—"Adolphus Crosbie," in *The Small House at Allington*, being a kind of modern "George Dandin." Though the sad fortunes of this peasant with social ambition do not fail to make us pity him somewhat, it is being too refined to regard *George Dandin* as a comedy with a concealed tragic intention. Molière must have been at work on *L'Avare* before *George Dandin* appeared, for the new comedy after Plautus was first acted on September 9th. There is a tradition that the piece almost failed; but, if unpopular in the first year of its production, it certainly gained favor before the death of its author. *M. de Pourceaugnac* (September 17, 1669), was first acted at Chambord for the amusement of the king. It is a rattling farce. The physicians, as usual, bore the brunt of Molière's raillery, some of which is still applicable.

Earlier in 1669 (February 5th) *Tartuffe* was played at last, with extraordinary success. *Les Amants Magnifiques*, a comedy-ballet, was acted first at Saint Germain (February 10, 1670). The king might have been expected to dance in the ballet, but from Racine's *Britannicus* (December 13, 1669) the majestic monarch learned that Nero was blamed for exhibitions of this kind, and he did not wish to out-Nero Nero. Astrology this time took the place of medicine as a butt, but the satire has become obsolete, except, perhaps, in Turkey, where astrology is still a power. The *Bourgeois Gentilhomme*, too familiar to require analysis, was first played on October 23, 1770. The lively *Fourberies de Scapin* "saw the footlights" on May 24,

1671, and on May 7th we read in La Grange, "les Repetitions de Spysche ont commenc  ." La Grange says the theater was newly decorated and fitted with machines. The *Comtesse d'Escarbagnas* (February 2, 1672) was another piece for the amusement of the court, and made part of an entertainment called *Le Ballet des Ballets*. In this play, a study of provincial manners, Moli  re attacked the financiers of the time in the person of M. Harpin. The comedy has little importance compared with *Les Femmes Savantes* (February 11th), a severer *Pr  cieuses*, in which are satirized the vanity and affectation of sciolists, pedants, and the women who admire them. Moli  re died on February 17, 1673, seven days after the first presentation of the *Malade Imaginaire*.

MOLINA, LUIS, a Spanish Jesuit, whom Pascal's *Lettres d'un Provincial* have rendered immortal, was born at Cuenca in 1535. He was called, at the end of twenty years, to the chair of moral theology in Madrid, where he died on October 12, 1600.

MOLINE, a city of Rock Island county, Ill., is situated in a picturesque district on the left bank of the Mississippi, opposite the upper end of Rock Island. First settled in 1832, the town was organized as a city in 1872. It is noted for its water-power, developed and maintained by the government, and for the number and importance of its manufacturing establishments. By means of a dam nearly a mile in length, from the Illinois shore to the island, an almost uniform head of seven feet of water is obtained, which is used in driving the machinery of the government arsenal on the island, and in supplying power to several factories. Beds of bituminous coal are mined in the neighborhood, and three lines of railway pass through the city, affording with the river ample means of communication. The most prominent manufactures are agricultural implements and machinery generally; wagons, organs, paper, and stoves. Moline has nine churches, a complete system of graded free schools, including a high school, and a free library. The population increased from 4,066 in 1870 to 7,805 in 1880, and with the suburbs the number is now (1902) returned at 17,248.

MOLINOS, MIGUEL DE, a Spanish priest whose name is intimately associated with that type of religion known in Italy and Spain during the latter half of the seventeenth century as Quietism, was born in the diocese of Saragossa about 1627 and died in 1696.

MOLISE, now CAMPOBASSO, a province of Italy, stretching twenty miles along the coast of the Adriatic, and bounded by the Abruzzi (Chieti and Aquila), Terra di Lavoro (Caserta), Benevento, and Capitanata (Foggia). About five-sixths of the surface may be described as mountainous or hilly, the loftiest range being the Matese on the border toward Benevento, with its highest point in Monte Miletto, 6,750 feet. The population, which increased from 346,007 in 1861 to 366,341 in 1901, is mainly dependent on pastoral and agricultural pursuits, neither manufactures nor trade being highly developed. According to the census of 1891, there were six places with more than 5,000 inhabitants—Campobasso, 12,890; Riccia, 8,123; Isernia, 7,715; Agnone, 7,147; Cascalende, 6,217; and Larino, 5,357; according to the census of 1881, 21 of the 133 communes had a population not exceeding 4,000.

MOLLUSCA. The Mollusca form one of the great "phyla," or subkingdoms of the Animal Pedigree or Kingdom. The shell-bearing forms belonging to this group which were known to Linn  us were placed by him (in 1748) in the third order of his class Vermes, under the name "Testacea," while the Echinoderms, Hydroids, and Annelids, with the naked Molluscs,

formed his second order termed "Zo  phyta." Ten years later he replaced the name "Zo  phyta" by "Mollusca," which was thus in the first instance applied, not to the Mollusca at present so termed, but to a group consisting chiefly of other organisms. Gradually, however, the term Mollusca became used to include those Mollusca formerly placed among the "Testacea," as well as the naked Mollusca.

It is important to observe that the Greek term, *μαλακία*, of which Mollusca is merely a Latinized form, was used by Aristotle to indicate a group consisting of the Cuttle-fishes only.

The definite erection of the Mollusca into the position of one of the great primary groups of the animal kingdom is due to George Cuvier (1788-1800), who largely occupied himself with the dissection of representatives of this type. An independent anatomical investigation of the Mollusca had been carried on by the Neapolitan Naturalist Poli (1791), whose researches were not published until after his death (1817) and were followed by the works of another Neapolitan zoologist, the illustrious Delle Chiaje.

The "embranchement" or sub-kingdom Mollusca, as defined by Cuvier, included the following classes of shell-fish: 1, the cuttles or poulps, under the name CEPHALOPODA; 2, the snails, whelks, and slugs, both terrestrial and marine, under the name GASTROPODA; 3, the sea-butterflies or winged snails, under the name PTEROPODA; 4, the clams, mussels, and oysters, under the name ACEPHALA; 5, the lamp-shells, under the name BRACHIOPODA; 6, the sea-squirts or ascidians, under the name NUDA; and 7, the barnacles and sea-acorns, under the name CIRRHOPODA.

The main limitations of the sub-kingdom or phylum Mollusca, as laid down by Cuvier, and the chief divisions thus recognized within its limits by him, hold good to the present day. At the same time, three of the classes considered by him as Mollusca have been one by one removed from that association in consequence of improved knowledge, and one additional class, incorporated since his day with the Mollusca with general approval, has, after more than forty years, been again detached and assigned an independent position, owing to newly-acquired knowledge.

The first of Cuvier's classes to be removed from the Mollusca was that of Cirrhopoda. Their affinities with the lower Crustacea was recognized by Cuvier and his contemporaries, but it was one of the brilliant discoveries of J. Vaugh  n Thompson, which decided their position as Crustacea. The metamorphoses of the Cirrhopoda were described and figured by him in 1830 in a very complete manner, and the legitimate conclusion as to their affinities was formulated by him. The next class to be removed from Cuvier's Mollusca was that of the Nuda, better known as Tunicata. In 1866 the Russian embryologist, Kowalewsky, startled the zoological world with a minute account of the developmental changes of Ascidia, one of the Tunicata, and it became evident that the affinities of that class were the Vertebrata, while their structural agreements with Mollusca were only superficial. The last class which has been removed from the Cuvierian Mollusca is that of the Lamp-shells, or Brachio-poda. The history of its dissociation is connected with that of the class, viz., the Polyzoa or Bryozoa, which has been both added to and again removed from the Mollusca between Cuvier's date and the present day. The name of J. Vaugh  n Thompson is again that which is primarily connected with the history of a Molluscan class. In 1830 he pointed out that among the numerous kinds of "polyps" at that time associated by naturalists with the Hydroids, there were many which had a peculiar and more

elaborate type of organization, and for these he proposed the name of Polyzoa. Subsequently they were termed Bryozoa by Ehrenberg (1831).

Henri Milne-Edwards in 1844 demonstrated the affinities of the Polyzoa with the Molluscan class Brachiopoda, and proposed to associate the three classes Brachiopoda, Polyzoa, and Tunicata in a large group "Molluscoidea," coordinate with the remaining classes of Cuvier's Mollusca, which formed a group retaining the name Mollusca. By subsequent writers the Polyzoa have in some cases been kept apart from the Mollusca and classed with the "Vermes;" while by others they have, together with the Brachiopoda, been regarded as true Mollusca. The recent investigation by Mr. Caldwell (1882) of the developmental history of Phoronis, together with other increase of knowledge, has now, however, established the conclusion that the agreement of structure supposed to obtain between Polyzoa and true Mollusca is delusive; and accordingly they, together with Brachiopoda, have to be removed from the Molluscan phylum. Further details in regard to this, the last revolution in Molluscan classification, will be found in the article POLYZOA.

As thus finally purified by successive advances of embryological research, the Mollusca are reduced to the Cuvierian classes of Cephalopoda, Pteropoda, Gastropoda, and Acephala. Certain modifications in the disposition of these classes are naturally enough rendered necessary by the vast accumulation of knowledge as to the anatomy and embryology of the forms comprised in them during fifty years. Foremost among those who have within that period labored in this group are the French zoologists Henri Milne-Edwards and Lacaze Duthiers, to the latter of whom we owe the most accurate dissections and beautiful illustrations of a number of different types. To Kölliker, Gegenbaur, and more recently Spengel, among German anatomists, we are indebted for epoch-making researches of the same kind. In England, Owen's anatomy of the pearly nautilus, Huxley's discussion of the general morphology of the Mollusca, and Lankester's embryological investigations, have aided in advancing our knowledge of the group.

The classes of the Mollusca which we recognize are as follows:—

Phylum MOLLUSCA.

BRANCH A.	BRANCH B.
Glossophora.	Lipocephala.
	(=Acephala, Cuvier).
Class 1.	Class 1.
GASTROPODA.	LAMELLIBRANCHIA.
<i>Br. a.—Isopleura.</i>	(Syn. Conchifera).
<i>Examples—</i> Chiton, Neomenia.	<i>Examples—</i> Oyster, Mussel, Clam, Cockle.
<i>Br. b.—Anisopleura.</i>	
<i>Examples—</i> Limpet, Whelk, Snail, Slug.	
Class 2.	
SCAPHOPODA.	
<i>Example—</i> Tooth-shell.	
Class 3.	
CEPHALOPODA.	
<i>Br. a.—Pteropoda.</i>	
<i>Examples—</i> Hyalæa, Pseudomodon.	
<i>Br. b.—Siphonopoda.</i>	
<i>Examples—</i> Nautilus, Cuttles, Poulp.	

The forms comprised in the above groups, while exhibiting an extreme range of variety in shape, as may be seen on comparing an oyster, a cuttle-fish, and a sea slug such as doris; while adapted, some to life on dry

land, others to the depths of the sea, others to rushing streams; while capable, some of swimming, others of burrowing, crawling, or jumping, some, on the other hand, fixed and immobile; some among the most formidable of carnivores; others feeding on vegetable mud, or on the minutest of microscopic organisms—yet all agree in possessing in common a very considerable number of structural details which are not possessed in common by any other animals.

The structural features which the Mollusca possess in common with other animals belonging to other great phyla of the animal kingdom are those characteristic of the Coelomata, one of the two great grades (the other and lower being that of the Coelentera) into which the higher animals, or Enterozoa as distinguished from the Protozoa, are divided. The Enterozoa all commence their individual existence as a single cell or plastid, which multiplies itself by transverse division. Unlike the cells of the Protozoa, these embryonic cells of the Enterozoa do not remain each like its neighbor and capable of independent life, but proceed to arrange themselves in two layers, taking the form of a sac. The cavity of the two-cell-layered sac or Diblastula thus formed is the primitive gut or arch-enteron. In the Coelentera, whatever subsequent changes of shape the little sac may undergo as it grows up to polyp or jelly-fish, the original arch-enteron remains as the one cavity pervading all regions of the body. In the Coelomata the arch-enteron becomes in the course of development divided into two totally distinct cavities shut off from one another—an axial cavity, the met-enteron, which retains the function of a digestive gut; and a peri-axial cavity, the coelom or body-cavity, which is essentially the blood-space, and receives the nutritive products of digestion and the waste products of tissue-change by osmosis. The Mollusca agree in being Coelomate with the phyla Vertebrata, Platyhelminthia (Flat-worms), Echinoderma, Appendiculata (Insects, Ringed-worms, etc.), and others—in fact, with all the Enterozoa except the Sponges, Corals, Polyps, and Medusæ.

The history of the shell in the development of Azygobranchia (and other Gastropods) is important. Just as the primitive shell-sac aborts and gives place to a cap-like or boat-like shell, so in some cases (Marsenia, Krohn) has this first shell been observed to be shed, and a second shell of different shape is formed beneath it.

A detailed treatment of what is known of the histogenesis in relation to the cell layers in these Mollusca would take us far beyond the limits of this article, which aims at exposing only the well-ascertained characteristic features of the Mollusca and the various subordinate groups. There is still a great deficiency in our knowledge of the development of the Gastropoda, as indeed of all classes of animals. The development of the gill (ctenidium) as well as of the renal organ, and details as to the process of torsion of the visceral hump, are still quite insufficiently known.

One further feature of the development of the Azygobranchia deserves special mention. Many Gastropoda deposit their eggs, after fertilization, inclosed in capsules; others, as Paludina, are viviparous; others, again, as the Zygobranchia, agree with the Lamellibranch Conchifera (the Bivalves) in having simple exits for the ova without glandular walls, and therefore discharge their eggs uncapsuled in capsules freely into the sea-water; such uncapsuled eggs are merely inclosed each in its own delicate chorion. When egg-capsules are formed they are often of large size, have tough walls, and in each capsule are several eggs floating in a viscid fluid. In some cases all the eggs in a capsule develop; in other cases one egg only in a capsule (Neritina), or a

small proportion (*Purpura*, *Buccinum*) advance in development; the rest are arrested either after the first process of cell-division (cleavage) or before that process. The arrested embryos or eggs are then swallowed and digested by those in the same capsule which have advanced in development. The details of this history require renewed study, our present knowledge of it being derived from the works of Koren and Danielssen, Carpenter, and Claparède. In any case it is clearly the same process in essence as that of the formation of a vitellogenous gland from part of the primitive ovary, or of the feeding of an ovarian egg by the absorption of neighboring potential eggs; but here the period at which the sacrifice of one egg to another takes place is somewhat late. What it is that determines the arrest of some eggs and the progressive development of others in the same capsule is at present unknown.

MOLLUSCOIDS. See **BRACHIOPODA** and **POLYZOA**.

MOLOCH, or **MOLECH**, is the name or title of the divinity which the men of Judah in the last ages of the kingdom were wont to propitiate by the sacrifice of their own children. Human sacrifices were common in Semitic heathenism, and at least the idea of such sacrifices was not unknown to Israel in early times (Isaac, Jephthah's daughter), though in the sunny days of the nation, when religion was a joyous thing, there is no reason to think that they were actually practiced. It was otherwise in the neighboring nations, and in particular we learn from 2 Kings iii. 27, that the sacrifice of his son and heir was the last offering which the king of Moab made to deliver his country. Ahaz's sacrifice of his son (which indeed rests on a somewhat late authority) must have been an isolated act of despair; human sacrifices are not among the corruptions of the popular religion spoken of by Isaiah and Micah. But in the seventh century, when the old worship had sustained rude shocks, and all religion was transformed into servile fear, the example of Manasseh spread to his people; and Jeremiah and Ezekiel make frequent and indignant reference to the "high places" for the sacrifice of children by their parents which rose beneath the very walls of the temple from the gloomy ravine of Hinnom or Tophet. It is with these sacrifices that the name of "the Moloch" is always connected; sometimes "the Baal" (lord) appears as a synonym. At the same time, the horrid ritual was so closely associated with Jehovah worship that Jeremiah more than once finds it necessary to protest that it is not of Jehovah's institution. So, too, it is the idea of sacrificing the first-born to Jehovah that is discussed and rejected in Micah vi.

MOLUCCAS, **MOLUCCOS**, or **SPICE ISLANDS**, **THE**, comprise, in the wider use of the term, all the islands of the East Indian Archipelago between Celebes on the west, the Papuan Islands and New Guinea on the east, Timor on the south, and the open Pacific on the north. They are thus distributed over an area measuring about 450 miles from east to west, and about 800 from north to south, and include—(1) the Moluccas proper or Ternate group, of which Jilolo is the largest and Ternate the capital; (2) the Batchian, Obi, and Sula groups; (3) the Ambon or Amboyna group, of which Ceram (Serang) and Buru are the largest; (4) the Banda Islands (the spice or nutmeg islands *par excellence*), of which Lanoir or Great Banda is the largest, and Neira politically the most important; (5) the southeastern islands, comprising Tenimber or Timor-Laut, Larat, etc.; (6) the Kei Islands and the Aru Islands, of which the former are sometimes attached to the southeastern group; and (7) the southwestern islands or the Babber, Samatta, Letti, Wetter, Roma, and Daume groups.

At the close of the sixteenth century this part of the archipelago was divided among four rulers settled at Ternate, Tidore, Jilolo, and Batchian. The northern portion belongs to the Dutch residentship of Ternate, the southern portion to that of Amboyna.

MOLYBDENUM, one of the rarer metallic elements, occurs in nature chiefly in the two forms of Yellow Lead Ore and Molybdenite. The latter mineral is very similar in appearance and in mechanical properties to graphite or black lead, and, in fact, was long confounded with it chemically, until Scheele, in 1778 and 1779, proved their difference by showing that only the mineral now called molybdenite yields a white earth on oxidation. The metallic radical of the earth, after its discovery by Hjelm, was called molybdenum.

MOMBASA, or less correctly **MOMBAS**, the *Mwita* of the Sawahili, a town on the east coast of Africa, with the best harbor on all the Zanzibar mainland. The coralline island of which it occupies the eastern portion is three miles long by two and a half broad, and lies in the middle of a double inlet of the sea stretching northward into Port Tudor (so called after the English officer who surveyed it) and westward into Port Reitz (after the English resident who died while exploring the Pangani river in 1823). The citadel, originally constructed by Xeixes and Cabrera in 1635, still remains in good condition. Of the twenty Portuguese churches which Mombasa once contained, only two or three can be identified. A few of the houses are built of stone, but most of them are mere thatched huts. In 1857 Burton estimated the inhabitants at 8,000 to 9,000, and in 1893 they numbered about 20,000.

MONACHISM. The word Monachism, or Monasticism, primarily meaning the act of "dwelling alone," has come, by an easy and natural transition, to denote the corporate life of religious communities living a life of poverty, celibacy, and obedience, under a fixed rule of discipline. The root-idea of monachism, in all its varieties of age, creed, and country, is the same—namely, retirement from society in search of some ideal of life which society cannot supply, but which is thought attainable by abnegation of self and withdrawal from the world. This definition applies to all the forms of monachism which have left their mark on history, whether among Brāhmans, Buddhists, Jews, Christians, Moslems, or the communistic societies of the present day, even when theoretically anti-theological.

The question has been warmly debated whether monachism be an evil or a good—whether a natural, perhaps a necessary, part of Christianity (as being, indeed, the strict logical issue of the triple vow of baptism, literally construed), or a foreign element introduced into it with unfortunate results, and rather an excrescence on its system than an orderly and healthy development. Unlike many other institutions which have needed the lapse of centuries and the gradual approach of decay and degeneracy to show their weak places, monachism in its Christian form displays some of its most unlovely features while yet almost in its cradle, whereas not a few of its best achievements belong to a late period in its history; and it has throughout displayed a singular elasticity and power of taking a fresh departure, after seeming to have exhausted its energies. Its champions and its opponents have thus always had ample materials for their briefs, and there is little probability of the controversy ever coming to an end. But the most philosophical mode of viewing its relation to Christianity is to recognize that monachism has made a part of every creed which has attained a certain stage of ethical and theosophical development; that there is a class of minds for which it has always had a powerful attraction, and which can otherwise find no satisfaction; and conse-

quently that Christianity, if it is to make good its claim to be a universal religion, must provide expression for a principle which is as deeply seated in human nature as domesticity itself, albeit limited to a much smaller section of mankind.

Three main factors combined to produce the phenomenon of monachism in early Christianity, each of them set in motion by the general dissolution of morals in the pagan society of the time, of which we get a sufficient glimpse from the Christian standpoint in the first chapter of the Epistle to the Romans, and from the pagan standpoint in the sixth Satire of Juvenal. These three factors were—(1) the Oriental tendency toward retirement, contemplation, and asceticism, influencing the infant Christian church through the agency of those Jewish ascetics, the Essenes and Therapeutae, who had begun long before the gospel times both the solitary and the common life in Palestine and Egypt, and who probably contributed many converts to Christianity, and became practically merged therein, as they disappear from history in the first century of the Christian era; (2) the Hellenic teaching of the Alexandrine Neo-Platonists on the purification of the intellect by abstention from physical indulgence; and (3), perhaps a more powerful influence than either, that old Roman spirit of austerity and discipline which, while looking back regretfully to the memories of the simpler habits of republican times, could find nothing amidst the social luxury and administrative weakness of the decaying empire which presented its ideal, save the monastic system with its rigid proscription of luxury, and even of comfort, in every form. Elijah and John the Baptist furnished examples of the solitary hermit type; the Schools of the Prophets at least seem to have been celibate and cenobitic communities, living by a fixed ascetic rule; and it is familiar to all that such was the actual discipline of the Essenes (see *ESSENES*).

There are five main classes of monastic institutions, each of which approximately marks a new departure in the history of Western monachism (for the East has never had more than the first), as they succeed one another in chronological order, without in any instance involving the abandonment of the previous foundations. They are—(1) Monks; (2) Canons Regular; (3) Military Orders; (4) Friars; (5) Clerks Regular. All of these have communities of women, either actually affiliated to them, or formed on similar lines.

It has been already mentioned that the bad side of monachism appears almost as early as its good side. While the system won the admiration of all the most eminent Christian teachers of the age which saw its birth and early growth, and while we are met by a still more remarkable fact that from the time when monachism was fairly established till we enter on the Middle Ages there are but two or three names of distinction among the clergy, whether as writers or administrators, to be found outside the ranks of monachism, among whom the most famous are Ambrose and Leo the Great, nevertheless, there is a heavy account on the other side. Not only did the institute speedily find itself caricatured by the Messalians, Euchites, Gyrovagi, Sarabaites or Remoboth, Circumcelliones, and other companies of professed ascetics, wild in doctrine, vagrant in habits, and turbulent in conduct, but the more genuine societies had scarcely fewer faults in too many cases. Severe asceticism operates differently on different natures, and while there are some whom it does but discipline and refine there are more whom it tends to coarsen and to brutalize, even apart from the many whom it is apt to affect with morbidness, if not actual insanity. And it is unquestionable that vast numbers of those who entered on the monastic life came from the poorer classes,

in search of some less toilsome mode of existence than they had previously led, preferring the contemplative societies, wherein almost no labor, certainly none of a severe and trying cast, was practiced, to those where agriculture and other active employments, requiring more energy than mat and basket weaving, were enjoined. Such men, uneducated and undisciplined, were liable to be thrown entirely out of gear by the complete revolution in their mode of life—especially when the community they joined was not only contemplative, but situated in some place where the ungrateful soil made tillage nearly impracticable, and the vast numbers crowded together were far too numerous for any tasks which could be assigned them. From the bosom of such societies came not only single examples of exaggerated spiritual pride, bitter fanaticism, avaricious greed of the scanty articles whose usufruct was permitted, fierce sensuality, and wild religious delusions, but they gave birth to companies like the "grazing monks," of Mesopotamia and Palestine, who roved about, shelterless and nearly naked, in the mountains and deserts, groveling on the earth, and browsing like cattle on the herbs they casually found; and to those fierce bands of Nitrian and Syrian ascetics who, reared in the narrowest of schools, treated any divergence from their own standard of opinion as a crime which they were entitled to punish in their own riotous fashion, two instances of which have left an indelible brand on their history—the murder of Hypatia in Alexandria, and that of the patriarch Flavian at the Robber Synod of Ephesus. An equally singular, but more sporadic and temporary, form of asceticism was that of the Stylites or Pillar-hermits, who followed a fashion first set by Simeon, a Syrian monk who spent almost half of the fifth century on the summit of a column sixty feet in height. This unwonted kind of austerity at first gave rise to strong objections, even from hermits themselves, and a messenger was sent to Simeon, bidding him in the name of a synod of bishops to descend from his pillar, but with instructions to permit him to remain if he showed himself ready to comply.

The history of monachism in the West is far more varied, chequered, and interesting than in the East. It takes its beginning from the visit of Athanasius to Rome in 340, during his second term of exile, when he brought with him his *Life of St. Anthony*, and pressed his example on the Roman Christians who mourned as patriots, not less than as devotees, over the lax and enervated habits of society. The popular imagination was caught at once, and not only was the basis of monachism successfully laid in Rome itself, but Eusebius of Vercelli introduced it into northern Italy, where it was fostered a little later by the illustrious Ambrose at Milan. From the very beginning a marked difference shows itself in the spirit of Western monachism as compared with the parent institute in the East. Partly from dissimilarity of climate, but still more from that of racial and national temperament, there has always been less tendency in the West to either abstract contemplation or severe self-torture, such as is equally common to many of the Egyptians or Syrian ascetics and to the Jogis of Hindustan. Hard work, with due intervals for food and recreation, occupied all that part of a Western monk's time which was not devoted to prayer or study, and a careful apportionment of his duties throughout the day gave each hour its appointed task to be fulfilled, leaving very few loose ends of time to be wasted.

Swiftly as monachism spread in Europe during the breaking-up of the Western empire, some of the causes which hastened its progress also tended to its rapid decay. The disturbed state of society, and, in particular, the prevalence of petty warfare, drove many thousands

of persons to seek a quiet refuge in the cloister without any more directly religious motive. When once there, they found in every place some rule in force which was either imported directly from Egypt or Syria, or else, like that of Casarius, modeled on Eastern lines, and therefore ill suited to the severer climate of Europe and the more active habits of the people. The austerities were thus too oppressive for general observance, and the result was a widespread neglect of rules which continued nominally in force, while at the same time the very monks who had ceased to keep them laid claim to special sanctity on the pretense of their strict way of life.

The special eminence of the Benedictines, in which they were without even the semblance of rivalry till the Jesuits arose, is that they were a missionary, civilizing, and educational body. It was as teachers of what for those times was scientific agriculture, as drainers of fens and morasses, as clearers of forests, as makers of roads, as tillers of the reclaimed soil, as architects of durable and even stately buildings, as exhibiting a visible type of orderly government, as establishing the superiority of peace over war as the normal condition of life, as students in the library which the rule set up in every monastery, as the masters in schools open not merely to their own postulants but to the children of secular families also, that they won their high place in history as benefactors of mankind. No doubt there was another side to this picture, even before the order began to deteriorate collectively; but the good actually effected far exceeded the evils which may have accompanied it. Ireland was the true stronghold of Celtic monachism, and before the close of the fifth century was already thickly planted with religious houses.

The tenth century—emphatically the "Dark Age" or "Age of Lead"—was the time when monachism, both in East and West, touched its lowest point. Three causes contributed to this in the West. First may be placed the raids of the Northmen; next, the growth of the feudal system, converting abbots into secular lords in virtue of the lands held by their monasteries being chargeable with feudal obligations; and lastly, the seizure and impropriation of monastic revenues by kings, princes, and bishops. The last of these causes was at work in the East also, further complicated, as we learn from the decrees of a council held at Constantinople in 861, by the foundation of monasteries intended from the first merely as sources of pecuniary advantage to the founders; although the success of Greek monks in the conversion of Bulgaria, Moravia, and, somewhat later southern Russia, showed that the cloister had not become quite effete even under the conditions of the Byzantine empire in that era.

The military orders arose in a more accidental fashion than any other variety of monachism, being due to the desire felt to lessen the perils which attended pilgrimage to Jerusalem, then almost as much part of the religious craving of Christendom as the hajj to Mecca is with devout Moslems. The Templars were at first designed only as an armed escort to protect the visitors from attack, and the idea of permanent guardianship of the Holy Places did not shape itself till later; while the Hospitalers (afterward famous as Knights of Rhodes and of Malta, as the main bulwark of Christendom against the Turks, and as maintaining the police of the Mediterranean against all pirates and rovers), borrowed the first idea of their institute from the knightly order of St. Anthony of Vienne, founded in Dauphiné about 1095, and devoted themselves originally to tending sick pilgrims at Jerusalem. The Teutonic Knights date from the third crusade, and owe their foundation to the sufferings of the duke of Swabia's army at the siege of

Acre, as it would seem that the Hospitalers were either unable or unwilling to supply the needed assistance. The military orders passed away when their work was ended; the Templars, as the victims of a great crime, closed by a ghastly tragedy; the Hospitalers, and those Spanish and Portuguese orders which were enrolled as regiments against the Arab invaders of the Peninsula, though titularly still existing, yet really ceased to be more than a name when the Moslem power in Europe was finally broken.

Yet another fresh departure in the history of monachism, in some respects the most momentous of all, was taken in the thirteenth century by the institution of the Mendicant Orders, or Friars. Pope Innocent III., in the thirteenth of the seventy constitutions or canons he promulgated at the Lateran council in 1215, had expressly forbidden the foundation of any new orders, bidding all who desired to embrace the monastic life join some approved community, and similarly directing that such as desired to found new houses should take their rule and constitution from one of the recognized societies. But circumstances were too strong for him, and this very pope was destined himself to sanction two of the most remarkable societies which the Latin Church has ever produced.

The two men founding those societies were Francis Bernardone of Assisi and Dominic Guzman of Osma. The ruling idea in the mind of the former was the elevation of poverty to the first place among Christian graces, as the most obvious way of conforming the life of a Christian to that of the founder of his faith; the more intellectual Spaniard dreamed of an aggressive body of skillfully-trained preachers, able at once to grapple with the subtle dialectic of the enemies of the established creed, and to appeal in clear and homely language to the uneducated, among whom the Albigenses and other sectaries were making considerable conquests. Both the new founders sought and obtained at Rome, after some difficulty, the approval of their new institutes, and that in the very year 1215 which had seen the formal prohibition of all fresh orders.

The Franciscan institute was a bold attempt to democratize the church; Dominic's Friar Preachers, though recruited freely from men of a humble grade, have always had somewhat more of an aristocratic tone about them, due to their intellectual calling; they have held a high place in Christian art, counting among them such names as Fra Angelico and Baccio della Porta; and their reputation for orthodoxy and for a purer type of moral theology than the Jesuit one has always stood high. They also count among their members the two most eminent divines of the Middle Ages, Albertus Magnus and Thomas Aquinas, and they have been fruitful in producing zealous missionaries; but the one great blot on their career is that they have been the directors and officials of the Inquisition ever since the formal constitution of that tribunal as a permanent organization. The Franciscans, less distinguished for mental triumphs than their competitors, have yet some famous names, chief of which are Duns Scotus and Roger Bacon—for Bonaventura, though set by the Franciscans as the "Seraphic Doctor" in competition with Aquinas, the "Angelic Doctor" of the Dominicans, is scarcely entitled to very high intellectual rank—and at one time they seemed likely to establish as firm a hold on the university of Oxford as the Dominicans did on that of Paris. The swiftest success and popularity attended the two new orders; privileges and exemptions were showered on them from Rome; wealth, in despite of their vow of mendicancy was emulously thrust upon them by the laity; and, above all, a remarkable and widespread religious revival, a dead-lift to ministerial efficiency in

every direction, repaid their early labors, while they had between them almost a monopoly of the popedom for nearly two hundred years. But their very success was fatal to their character. The vow of poverty was the first part of their institute to break down. Even before they began to be counted among the richest orders of Christendom, there is indisputable evidence—that of Bonaventura, himself general of the Franciscans—that the mendicant system was working nothing but mischief.

As the thirteenth century is the apogee of later monachism, so the decline begins steadily at the very outset of the fourteenth (which is also the date of ordination becoming the normal custom for choir-monks, instead of the exception as formerly), continuing down to the crash of the Reformation. The great schism of the West, the rise of the Wycliffites and Lollards in England, and of the body later known as Hussites in Bohemia, could not fail to act injuriously on the monastic orders; and though the creation of fresh ones continued, none of those founded during this era were influential, and few durable.

In the Reformation era itself the monastic bodies had sunk so low in the estimation of even the rulers of the church that one clause in the report of the committee of cardinals appointed by Pope Paul III. (a body composed of Sadolet, Contarini, Reginald Pole, Giberti, Fregoso, Badia, Aleandro, and Caraffa, afterward Paul IV.), delivered in 1538, demanded their abolition.

The interests involved were, however, too vast and complicated, the supposed impolicy of an admission on so large a scale of the charges alleged against monachism by the men of the New Learning too serious, to allow of any such sweeping measure of reform as that proposed by the cardinals being carried out. A certain amount of discouragement shown toward the older societies; the enactment of some partial corrections by the council of Trent, not touching any principle whatever, but apparently saying something because public feeling looked for something to be said; and, above all, the creation of a new type of order, the famous Company of the JESUITS (1534), represent the total action taken by the Roman Church during the actual crisis of the Reformation.

At the French Revolution, the religious houses, amounting (without reckoning various minor colleges and dependent establishments) to 820 abbeys of men and 255 of women, with aggregate revenues of 95,000,000 livres, were suppressed by the laws of February 13, 1790, and August 18, 1792. In Germany the storm had broken somewhat earlier, if not quite so violently. The Thirty Years' War had wrought much mischief to not a few of the religious houses, without taking into account the great number which had been destroyed in the territories of the Protestant princes; and when the death of Maria Theresa in 1780 left her son Joseph II. free to act as he pleased, he dissolved the Mendicant orders, and suppressed, in despite of the personal remonstrances of Pius VI., the greater number of monasteries and convents in his dominions. In Italy despite the multiplication of new institutes, the process of decay continued throughout the seventeenth century.

The terrible crash of the French Revolution, which affected, directly or indirectly, every country in Europe, was not least influential in its incidence on monachism. On the one hand, the actual destruction which it brought upon the religious houses of France was adopted as part of the revolutionary programme in all countries where such institutions were still intact; and, on the other, there was a considerable measure of improvement brought about in not a few places by the fear of public opinion, while the new institutes which continued to spring up were all but invariably active, both

founders and the sanctioning authorities recognizing that any society seeking to make its footing good must needs first prove its capacity for practical usefulness. In France itself the laws which abolished all religious communities were relaxed by connivance in favor of the Sisters of Charity even under the Terror and the Directory; while in 1801 a decree of the Consular Government, issued by the Minister of the Interior, authorized Citizeness Duleau, former superior of that society, to revive it by taking young women to train for hospital work and various other active communities were restored by Napoleon in 1807. Further revivals took place at the Restoration, the most celebrated of which was the Dominican, owing to the talents and eloquence of Lacordaire and the group he gathered round him; but Benedictines, Carthusians, Trappists, and other societies of the older type were not slow to avail themselves of the opportunity to return and to found anew, amidst a poverty which recalls the original institution, their abbeys and priories. But they met with little favor under the Orleanist monarchy, and the Second Empire was their time of most security and progress. Since its fall, they have again been actively discouraged by a strong party in the Republic, and their position remains precarious. France has been, further, the chief seat of the many new societies founded for some especial department of charitable work, the most characteristic example of which is perhaps that of the Little Sisters of the Poor.

The fall of the religious houses in Spain dates from the law of June 21, 1835, which suppressed 900 monasteries at a blow, and the remainder had but a short respite, as they were dissolved on October 11th of the same year. In Portugal, where a bias against the Roman Curia has been a traditional part of patriotism ever since the revolution of 1640, when the pope sided with Spain against the house of Braganza, there was little feeling to protect the monasteries when it happened that the crown wanted their possessions, and they were all suppressed by the decree of May 28, 1834. No European country had so many religious houses as Portugal in proportion to its population and area, and the number of the foundations dissolved in 1834 exceeded 500. In Switzerland a considerable measure of suppression followed the war of the Sonderbund in 1847, while in Italy, the last country where monachism had remained almost unmolested, an act was passed in the Sardinian Parliament on July 7, 1866, for the suppression of monasteries within the Piedmontese dominions, and for the confiscation of their property. The measure was extended to the whole of Italy after the unification of the kingdom; the orders were expropriated in 1873; their houses were declared national property, and were put to secular uses, no exception being made in favor of San Marco at Florence, of Assisi, of Vallombrosa, or even of Monte Cassino itself.

On the other hand, several Roman Catholic societies have attained considerable success in the United States and Canada, thus in some degree recovering for the principle they represent part at least of the ground lost in Europe, while in three religious communions outside the pale of the Latin obedience—the Evangelicals of Germany, the Reformed of France, and the Church of England—the organization of women for charitable and religious work on the lines of various old institutes has been actively carried out.

MONACO, the smallest of the sovereign principalities of Europe, with an area of 8.34 square miles, a population of 13,304, and an army of seventy-two men, is situated on the coast of the Mediterranean, nine miles east of Nice, and bounded on all sides by the French department of the Maritime Alps. Previous to 1861,

when the communes of Mentone (Menton) and Rocca-bruna (Roquebrun) were sold to France for 4,000,000 francs, the area was about a third larger; but the population, which with those portions again included would now be 15,000, was only about 8,000. Monaco has long had the reputation of being one of the most beautiful and sheltered spots on all the Franco-Italian coast. The town occupies the level summit of a rocky headland, rising about 195 feet from the shore, and still surrounded with ramparts. Though largely modernized, the palace is a fine specimen of Renaissance architecture. The gaming establishment is now in the hands of a joint-stock company with a capital of 15,000,000 francs. None of the inhabitants of Monaco have access to the tables; and their interest in the maintenance of the *status quo* is secured by their complete exemption from taxation, and the large prices paid for their lands. Gambling-tables were set up at Monaco in 1856; but it was not till 1860, when M. Blanc, expelled from Homburg, took possession of the place, that Monte Carlo began to be famous.

MONAGHAN, an inland county of Ireland in the province of Ulster, is bounded east by Armagh, south-east by Louth, south by Meath, southwest by Cavan, west by Fermanagh, and north by Tyrone. The area is 318,806 acres, or 498 square miles. The north-western part of the county is included in the great central plain of Ireland; but in the southeast there is an uprising of Lower Silurian rocks.

The area of arable land was 278,755 acres, or 87 per cent. of the whole, while 5,258 were under plantations, 7,580 bog and marsh, 5,239 barren mountain land, and 21,582 water, roads, and fences. The only manufacture of consequence is linen, which of late years has been on the increase. The population in 1841 was 200,442, but in 1851 it had diminished to 141,823, in 1871 to 114,969, and in 1881 to 102,748, of whom 50,077 were males and 52,671 females.

MONARCHIANISM, in its technical Christological sense, designates the view taken by those Christians who, within the church, toward the end of the second century and during the third, opposed the doctrine of a hypostatic Logos (hypostasianism) or of an independent personal subsistence of the Divine Word.

MONASTICISM. See MONACHISM.

MONASTIR, BITOLIA, or TOLI MONASTIR, a city of Macedonia, now the chief town of the Turkish vilayet of Roumelia, is situated at a height of 1,880 feet above the sea, in a western inlet of the beautiful, fertile, and many-villaged plain which, with a breadth of about ten miles, stretches for forty miles eastward from Mount Peristeri (7,714 feet high) to the Babuna chain. The population is about 40,000.

MONBODDO, JAMES BURNETT, LORD, author of works on the *Origin and Progress of Language* (published in 1773), and *Ancient Metaphysics* (1779), was one of the most marked characters in Scottish literary circles in the eighteenth century. He was born in 1714, and died in 1799.

MONCTON, a town of the Dominion of Canada, in Westmoreland, New Brunswick, eighty-nine miles by rail northeast of St. John, is a port at the head of navigation on the Petitcodiac, and the seat of the workshops and general offices of the Intercolonial Railway. Population, 9,026.

MONDONEDO, an ancient city of Spain, twenty-seven miles north-northeast from Lugo, in the province of that name, is situated on the *Sixto*, a small tributary of the *Masma*, on the Atlantic side of the Cantabrian chain, in a sheltered site surrounded on all sides by considerable hills. The population is 11,000.

MONDOVI, a city of Italy, in the province of Cuneo,

fifteen miles east of Cuneo and about fifty-five miles west of Genoa by rail, was formerly the chief town of the Sardinian province of Mondovì, and between 1560 and 1719 the seat of a Piedmontese university. Population (1001), about 21,000.

MONEY. The precise definition of Money is a question presenting no small difficulty, and it has been complicated by the attempts of some writers to define the term so as to lend support to their favorite theories. The real difficulties of the subject are, however, chiefly connected with paper-money, and as that side of the question has been dealt with in the article BANKING it will here be sufficient to adopt the clear and careful description of money given by a distinguished American economist as being "that which passes freely from hand to hand throughout the community in final discharge of debts and full payment for commodities, being accepted equally without reference to the character or credit of the person who offers it and without the intention of the person who receives it to consume it or enjoy it or apply it to any other use than in turn to tender it to others in discharge of debts or payment for commodities." The functions which money discharges in the social organism are—at least in the opinion of all writers worth noticing here—clearly manifest. The most important is that of facilitating exchanges. It is not necessary to dwell on the great importance of this office. The mere consideration of industrial organization shows that it is based on the division of employments; but the earliest economic writers saw clearly that division of employments was rendered possible only by the use of a medium of exchange. They saw that the result of increasing specialization of labor was to bring about a state of things in which each individual produced little or nothing directly adapted to satisfy his own wants, and that each one was to live by exchanging his products for those of others. They saw, moreover, that this was not feasible without some object which all would be willing to accept for their peculiar products, for otherwise, the difficulty of getting those together whose wants were reciprocal would be a complete hindrance to the development of exchange, which alone made division of labor possible. A second function hardly inferior in importance to the one just mentioned is that of affording a ready means of estimating the comparative value of different commodities. Without some common commodity as a standard of comparison this would be almost impossible. Indeed it may be reasonably maintained that the idea of general value could not be formed without the existence of money, and all that is known of savage races tends to bear out this view. The adoption of some one commodity renders the comparison of values easy. The chosen commodity becomes a *common denominator* or *common measure of value* in terms of which we estimate the values of all other goods, and thus money, which in its primary function renders exchanges possible by acting as an intermediate term in each exchange, also makes exchanges easier by making them definite. Another function of money comes into being with the progress of society. One of the most distinctive features of advancing civilization is the increasing tendency of people to trust each other. Thus there is a continual increase in relations of contract, as may be seen by examining the development of any legal system. Now a contract implies something to be done in the future, and for estimating the value of that future act a standard is required; and here money, which already acts as a *medium of exchange* and as a *measure of value* at a given time, performs a third function, by affording an approximate means of estimating the present value of the future act, and in this respect may be regarded as a *standard of*

value, or, if the phrase be preferred, of *deferred payments*. Some writers attribute a fourth function to money, inasmuch as they regard it as being a means of easily storing up value.

The problem of the determining causes of the value of money is a particular case of the general problem of values, but there are circumstances which render the inquiry more than usually complicated. Before considering these it will be well to deal with a use of the phrase "value of money" which has led to much confusion. In mercantile phraseology the value of money means the interest charged for the use of loanable capital. Thus, when the market rate of interest is high, money is said to be dear, when it is low, money is regarded as cheap. Whatever may be the force of the reasons in favor of this use, it is only mentioned here for the purpose of excluding it. For our present subject, "the value of a thing is what it will exchange for; the value of money is what money will exchange for, or its purchasing power. If prices are low, money will buy much of other things, and is of high value; if prices are high, it will buy little of other things, and is of low value. The value of money is inversely as general prices, falling as they rise and rising as they fall." Now in the general theory of value it appears that the *proximate* condition which determines it is the equation between supply and demand; and this is clearly the case with reference to money. These terms, supply and demand, need, however, some elucidation. The supply of a commodity means the quantity of it which is offered for sale. But in what shape does the sale of money take place? By being offered for goods. "The supply of money, then, is the quantity of it which people are wanting to lay out;" or, to put the point more concisely, it is "all the money in circulation at the time." Again, to take the case of demand—the demand for a commodity is the purchasing power offered for it. Demand in the special case of money consists of all the goods offered for sale. There is, however, a peculiar feature in the case of money which arises from its position as the medium of exchange, viz., that money is, so to say, in a "constant state of supply and demand," since its principal service is to act as the means of purchasing commodities. From this it follows that the factors which determine the value of money within a given time are: (1) the amount of money in circulation, and (2) the amount of goods to be sold. On closer examination it will, however, appear that there are other elements to be taken into account. In the first place, the quantity of money is not by itself the sole element on the supply side. In some instances a coin will not circulate more than two or three times in a year, while another coin may make hundreds of purchases. In determining the value of money these varying rates of circulation have to be considered. On the side of demand, again, it is not the quantity of commodities that is the determining element, but the amount of sales, and the same article may, and generally does, pass through several hands before it reaches the consumer. From this it follows that (if the consideration of credit in its various forms be omitted) the value of money is inversely as its quantity multiplied by its efficiency, the amount of transactions being assumed to be constant.

It must be noticed that it is not commodities only that are exchanged for money. Services of all kinds constitute a large portion of the demand, while the payment of interest on the various forms of obligation requires a large amount of the circulating medium. The potent influence of credit also must be dwelt on. This latter force is the main element to be considered in dealing with variations of prices; but so far as it is based on a deposit of metallic money it may be looked on as a means of increasing the efficiency of money, and

therefore as coming within the formula given above. In its other aspects it lies outside the range of this article. Some interesting conclusions may be deduced from the results we have arrived at. One of these is that the "increased development of trade," or "expansion of commerce," of *itself* tends to lower not to raise prices; for, by increasing the work which money has to do while the amount remains the same, it raises its value. Another consequence is that a large addition may be made to the money in a country without any effect being produced on prices. This is evident, since money only acts on prices by being brought into circulation; therefore, if the money which is added to the national stock is not used in this way, prices will remain unaffected.

We have now sufficiently considered the proximate conditions which determine the value of money; the next step is to inquire: What is the ultimate regulator of its value? The value of freely-produced commodities is—according to the ordinary theory of economists—determined by their "cost of production," or, where the article is produced at different costs, by the cost of production of the most costly portion. Gold and silver, the principal materials of money, are the products of mines, and are produced at different costs; therefore the cost of the part produced at greatest cost ought to determine their value. This theory is, however, true only under certain conditions—namely, that competition is perfectly free, and that there are accurate data for computing the cost of production, and even then it is true only in the long run. Moreover, cost only operates on value by affecting supply. In former periods it was a common proceeding on the part of the state to either restrict or stimulate coinage and mining for the precious metals. At all times the working of gold and silver mines has been rather a hazardous speculation than a legitimate business. With regard to the adjustment of supply to meet an altered cost of production, the difficulties are, if possible, still greater. The supply of money is so large compared with the annual production, that any change can operate but slowly on its value. The total stoppage of fresh supplies from the mines would not be felt for some years in the increased value; and an increased amount of production, though more rapid in its operation, takes some time to produce an effect. "Hence the effects of all changes in the conditions of production of the precious metals are at first, and continue to be for many years, questions of quantity only, with little reference to the cost of production." On these grounds it is apparent that cost of production is not, for short periods, the controlling force which governs the value of money, and even for long periods the speculative nature of the industries connected with the production of money renders the cost of production an element very hard to ascertain. Another consideration which gives a peculiar feature to the problem of money-value is that in the case of other commodities a change in the cost of production affects value without any actual change in the supply. The knowledge that a commodity can be produced at a lower cost will cause a reduction in its value. This is not true of money. Either the quantity or the efficiency of money must be altered to change its value.

The next question which arises is: What quantity of money does a nation require? What amount of the circulating medium is necessary for the proper working of the industrial organism? To this puzzling problem the earlier economists gave answers in the shape of definite formulæ. Modern statisticians, however, though having command of much greater resources, decline to attempt a quantitative answer, and content themselves with indicating the conditions which the problem involves. In fact, we must first examine the work which money

has to perform, and this depends on several conditions. The first of these is the population; *ceteris paribus*, twice as many people will want twice as much money. The second is the amount of transactions; for, if the amount of business done is doubled, the amount of money must also be doubled, unless at the same time some improvement in credit is introduced. The efficiency of money is a third element which affects the quantity needed, and this is largely dependent on the habits of the people and the facilities for communication. Another factor which requires to be estimated is the extent to which habits of hoarding exist; for all money hoarded is withdrawn from circulation, and therefore increases the total amount needed. The habits of saving in the rural districts of France remarkably exemplify this element in the question. Again the existence of barter does away with the use of so much money as would be required to carry on the exchanges effected by barter. The custom of paying wages in kind has a similar effect. This bare statement shows how insoluble the question is. When we contemplate the matter from an international point of view, the amount needed, after allowance is made for the cost of transporting goods, is plainly that which will keep a country's prices at a level with those of the countries with which it has commercial relations. For otherwise the country would have an excess either of importation or of exportation, which would necessitate a flow of money to the country whose prices were lower than the general level. This, then, is the condition which determines comparative prices between different countries; and prices being so determined, the quantity of money needed to keep up those prices depends on the conditions above indicated.

The use of metals as a form of money can be traced far back in the history of civilization, but, as it is not possible to ascertain the historical order of their respective adoptions for this purpose, we will take them in the order of their value, beginning with the lowest. Iron, judging from the statement of Aristotle, was extensively employed as currency. Lead has also served as money, as it does at present in Burmah. Copper has been more widely employed than either of the previously-mentioned metals. The early Hebrew coins were chiefly composed of it, while down to 269 B.C. the sole Roman coinage was an alloy of copper. Till a very recent period it formed the principal money of some poorer European states (as Sweden), and was the subsidiary coinage of the United Kingdom till the present bronze fractional currency was introduced. Tin was not so favorite a material for money as copper, but the early English coinages were composed of it, probably on account of the fertile tin mines of Cornwall, and in later times halfpence and farthings of tin have been struck. The next metal which comes into notice is silver, which up to the last few years was the principal form of money, and even still is able to dispute the field with its most formidable rival. It formed the main basis of Greek coins, and was introduced at Rome in 269 B.C. The mediæval money was principally composed of silver, and its position in recent times will have to be subsequently noticed more at length. Gold, which is the most valuable of the metals widely used for monetary purposes, has been steadily gaining ground with the growth of commerce. The earliest trace of its use in common with that of silver is to be found in the pictures of the ancient Egyptians weighing in scales heaps of rings of gold and silver. The only other metals used for money—platinum and nickel—may be easily disposed of. The former of these was coined for a short time by the Russian Government, and then given up as unsuitable. The latter is only used as an alloy, and in the United States for a petty coin.

The examination of the forms of currency, both metallic and non-metallic, in which we have been engaged leads to certain definite conclusions as to the course which the evolution of currency is pursuing. It appears that the metals tend to supersede all other forms of money among progressive peoples, and that certain metals tend to supersede the others. From this we are led to consider the qualities which are desirable in the material of money, and to conclude that the presence or absence of those qualities is the reason of the adoption or rejection of any given substance.

In the first place, it is necessary that the material of money should be desirable, or, in other words, possess value; and to this condition all the commodities we have reviewed conform, for otherwise they would never have attained the position of being a medium of exchange. This quality, then, is not the reason for the preference of some forms over others. The second requisite clearly is that the value of the article shall be high in proportion to its weight or bulk, or, to put the same truth in another way, it is requisite that it shall be portable. Want of this quality has been a fatal obstacle to many early forms of money retaining their place. Skins, corn, and tobacco were found very difficult to transfer from place to place. Iron and copper too suffered from the same defect, while sheep and oxen, though moving themselves, were expensive to transfer. It is further desirable that the material of money shall be the same throughout, and that one unit shall be equal in value to another. The metals possess a particular advantage in this respect, as, after being refined, they are almost exactly homogeneous. A fourth requisite is that the substance used as money can without damage be divided and, if needed, united again. Money must also be durable. Money should be easily distinguishable, and there should be no trouble in ascertaining its value. This condition is one of the reasons why precious stones have never been much used as money, their value being hard to estimate. The same objection applies to most non-metallic currencies, and is only obviated even in their case by the process of assaying. The last condition which appears desirable for the money material is, that its value shall be steady. It is enough for the other purposes of money that it shall not vary within short periods, which is found to be a feature of metals, and especially of silver and gold, while corn especially varies widely in value from season to season. From the foregoing examination of the requisites desirable in the material of money it is easy to deduce the empirical laws which the history of money discloses, since metals, as compared with non-metallic substances, evidently possess those requisites in a great degree. They are all durable, homogeneous, divisible, and recognizable, and in virtue of these superior advantages they are the only substances now used for money by advanced nations.

The elimination of the cheaper metals leaves silver and gold as the only suitable materials for forming the principal currency. Of late years there has been a movement toward the adoption of the latter as the sole monetary standard, silver being regarded as suitable only for a subsidiary coinage. Indeed this question may be regarded as the principal matter of controversy in the field of metallic currency. The special features of gold and silver which render them the most suitable materials for currency may here be noted. "The value of these metals changes only by slow degrees; they are readily divisible into any number of parts which may be reunited by means of fusion without loss; they do not deteriorate by being kept; their firm and compact texture makes them difficult to wear; their cost of production, especially of gold, is so considerable that they possess

great value in small bulk, and can of course be transported with comparative facility; and their identity is perfect." The possession by both these metals of all the qualities needed in money is more briefly but forcibly put by Cantillon when he says that "gold and silver alone are of small volume, of equal goodness, easy of transport, divisible without loss, easily guarded, beautiful and brilliant, and durable almost to eternity." This view has even been pushed to an extreme form in the proposition of Turgot, that they became universal money by the nature and force of things, independently of all convention and law, from which the deduction has been drawn that to proscribe silver by law is a violation of the nature of things.

The earliest systems of currency whose progressive debasements it is possible in any degree to trace are those of the various Greek states, though even here many details remain in obscurity. The Roman currency system is comparatively better known; while for the mediæval currencies from the time of Charlemagne (800 A.D.) elaborate materials are available, which naturally increase in bulk and precision as we approach more modern times. The general treatment of the history of coins belongs to NUMISMATICS (*q.v.*); but the history of monetary depreciations is important in connection with the theory of money as illustrating the value of sound economic knowledge.

Until coinage became a state function a continued debasement was impossible, since it was open to any one to refuse the money offered in payment if it was not up to the proper standard. When, however, coinage became a function of government, strong motives for debasement soon presented themselves. Whatever may be the inducements to enter on the perilous course of tampering with the monetary standard, a long experience has incontestably proved its disastrous effects. One of the great causes of the weakness of France during the "hundred years' war" was the extremely debased state of its currency, and the dread of further reductions in the value of the coins. Lord Macaulay has given a graphic picture of the evils which England suffered from its depreciated silver currency toward the end of the seventeenth century. So manifest are the evils that result from debasement that it may be reasonably hoped that all civilized governments have abandoned the practice for ever; though, unfortunately, similar bad effects are produced by the over-issue of inconvertible paper currencies, and this is still an expedient adopted under the pressure of difficulties.

The discussion of matters relating to currency, and the increased intercourse among the more advanced nations, have led to the raising of some questions with regard to the proper constitution of monetary systems. Each country possessing any claim to enlightenment has directed its attention to its own monetary arrangements, and compared them with those of others, while the effect which the currency system of any nation exercises on its neighbors leads to the exciting of a lively interest in its monetary legislation. The principal problems may be summed up under three heads: (1) The proper standard to use, the discussion of which in practice turns on the comparative merits of a single standard of gold or silver and of a double standard of gold and silver at a fixed ratio; (2) the system of subdividing the currency, which is generally discussed under the title of proposals for decimal coinage; (3) proposals made in many quarters to assimilate the various currency systems of the world. These take one of two forms. It is either desired that a group of nations shall assimilate their currencies, in which case the coinage may be called an international one; or a wider view is taken, and a single system is advocated for all states. This may be styled universal

coinage. Every currency system must be based on a *standard unit of value* which consists of a "fixed quantity of some concrete substance defined by reference to the units of weight or space." Thus the English unit is the *pound*, which consists of a definite quantity of gold (123.27447 grains standard fineness), while the French unit is the *franc* (composed of five grammes of silver nine-tenths fine). It is not, however, necessary that the standard unit shall be a coin. All that is needful is that the current coins shall be multiples or sub-multiples of the unit, or at all events easily reducible to it.

Another distinction must be pointed out, namely, that between *standard* and *token* money, the former being of the same value as the metal it is made of, while the latter is rated at a nominal value higher than that of its material. The silver and copper coins in England and the smaller silver coins in the Latin Union are merely tokens, being, in the case of the English silver coins, about 30 per cent. below their nominal value. The French coins are of inferior fineness (\$35 per 1000). Token coins are only admissible in small payments, as otherwise—in accordance with an elementary principle to be presently explained—the standard coins would be driven out of circulation. The maximum amount in payment for which they are legal tender is in England 40 shillings, or \$10. One of the functions of money being to afford a standard for estimating deferred payments, it is generally used as the means of discharging obligations when they become due, and in this aspect is styled *legal tender*. The principal coinage of any country is legal tender to an unlimited amount, and, when offered, discharges any pecuniary obligation. It is only the standard coinage which possesses this property, or rather the standard coinage is that which does possess it.

In discussing monetary questions it is also important to remember that a metallic currency has to circulate among the most diverse classes of society, and must be suited to the wants, and even to the prejudices, of the population using it. The great mass of a population, it is true, take and give money without particularly observing it. It is enough if the coin conforms to the usual type. There exists, however, in all mercantile communities a class of dealers in money who make a profit by selecting the best coins for exportation, or, if two metals are in concurrent use, the coins of that metal which is undervalued in the proportion fixed. The mode in which self-interest thus operates produces an effect which may be briefly formulated by saying that *bad money drives out good money*. It is often now called "Gresham's law," from a former minister of the English mint, who observed it.

The simplest form of currency seems to be that in which the state coins ingots of different metals, and allows them to circulate freely, without any ratio being fixed. This, which is the lowest form of currency proper, has arisen in many countries through the introduction of coins of various other nations. Turkey is a European example. Many of the South American republics possess a currency of this description. A theoretical form of this system has been advocated in France. It is proposed to issue coins of one, two, five and ten grammes of gold, and to allow the present silver coins which are multiples of the gramme to circulate along with them. The difficulties of this plan are so obvious that there is no likelihood of its being adopted. The arguments in its favor are of little force, since it is hardly correct to contend that it is a natural system, when it has never been willingly adopted by any country. The next system to be noticed is that of a single metal being fixed as legal tender. This in early times is the really natural arrangement, and has been

widely adopted. It is needless to recapitulate the instances which have already been given in dealing with other matters. There is, however, a difficulty which soon arises under this system. If the metal chosen is not very valuable, it is too cumbersome for large payments; if, on the other hand, it possesses a high value, it is hard to coin pieces suitable for small transactions. Thus, even silver would be too bulky for such payments as frequently occur. \$500 in silver at its present value would weigh over forty pounds, while it would be impossible to coin gold pieces of the value of a cent or even a dime. This system thus naturally leads to the use of other metals besides the standard one, and when the state fixes the ratio between these metals a new system has come into existence, which has been called the *multiple tender* system. In it the ratios between the metals are fixed, either once for all, or until changed by state authority. The fluctuation of currencies arranged on this method, owing to the action of Gresham's law, has led in England and Germany to a modified system, which seeks to combine any advantages of the multiple standard with the principle of the single standard. By this method one metal is fixed as the principle legal tender, while the smaller coins are made of a less valuable material, and circulated at a nominal value somewhat above their real one, or, in other words, as token coins, but they are only legal tender to a limited amount. This has been called the *composite legal tender* system.

Only three systems of standard money need be here examined, namely, the *single* standard system, the *multiple* standard system, and, lastly, the *composite* system. Nor even is there any need for examining the various possible single or multiple standards. The single silver standard is the only one of the former, as the double gold and silver standard is the only one of the latter, which need be taken into account. The advance of gold to a position parallel to silver was commenced in the thirteenth and continued in the fourteenth century, the method of regulating the mixed gold and silver currencies being by proclamation, which fixed the varying ratios from time to time. In England this course was followed from the first introduction of gold coins (1257) to 1663. From 1663 to 1717 silver was the standard, and the gold coins passed at their market value. As the silver coins were very much debased, the gold guinea sometimes was deemed equivalent to 30s. After the recoinage of 1696 the guinea passed at 21s. 6d. At this ratio silver was underrated, and was accordingly exported to Continental Europe and to India. The loss of the silver coins aroused the public attention, and the matter was submitted to Sir I. Newton, whose answer was given in his *Third Representation*. He proposed to reduce the guinea from 21s. 6d. to 21s. as an experimental measure. The proper reduction for the object in view would have been to 20s. 8d. The silver drain, therefore, continued, and England came to have a gold currency. An opposite arrangement gave France a silver coinage. The recent facts of French monetary history, as well as those of the United States, illustrate the same condition of affairs. The difficulty of constituting a double standard system on a secure basis is thus made clear, so far at least as regards a single country. For the continuance of the two metals in the currency depends on the market ratio and the legal ratio between gold and silver being the same. The slightest examination of the history of these metals will show how variable they have been. Without accepting the estimates which regard silver as being more valuable than gold, the well-attested variations of the precious metals have been very considerable. Thus, Herodotus estimates the

ratio as one to thirteen, Plato one to twelve, Menander one to ten, and in Cæsar's time the ratio was one to nine.

In the fourteenth century the value of gold rose remarkably, and the gradual movement has ever since been toward an appreciation of gold relatively to silver. Another point, previously noticed, is the tendency, as wealth increases, to adopt a more valuable form of currency. Greece, Rome, and England all afford illustrations of this movement. The experience of the evils of a mixed currency led the earlier writers on coinage in England to regard a single standard system as the best, and silver as the most suitable metal for the standard. Locke, Petty, and Harris all advocated this view. The earlier Italian writers proposed to combine gold and silver at a ratio of one to twelve, which they conceived to be the actual proportion. The theory of a composite system was as before mentioned, first given by Lord Liverpool. This method of regulating the metallic currency was established in England, as it were, accidentally, and deliberately adopted only in 1816. The practical good results which followed made all English economists of that period warm advocates of the composite system. Thus, M'Culloch and Tooke agree in supporting the English system, as also does J. S. Mill. On the Continent the weight of authority was more divided, and the existence of the French bimetallic system gave support to the advocates of a double standard. The result of the gold discoveries in Australia and California was to greatly increase the supply of that metal, and, under the action of Gresham's law, to change the French currency from silver to gold, while Holland, to avoid the evils which were anticipated from the reduced value of that metal, adopted silver as the standard. The movements in favor of a universal currency described above, combined with the course of events, brought the standard question into greater prominence. The proposal of the Paris conference of 1867, for a single gold standard, and a universal coinage on that basis, raised the question to great prominence. Wolowski and Courcelle Seneuil strongly opposed the recommendation, the former predicting that a disastrous appreciation of gold would follow. This view seems borne out by the result, for, although a universal coinage was not created, yet Germany and the Scandinavian Union both changed from a silver to a gold standard, while Holland and the United States both made movements in the same direction by demonetizing silver and making preparations for adopting gold. The Latin Union at the same time restricted their silver coinage, which had nearly the same effect as the adoption of a gold standard. The result of these extensive changes was to cause much confusion. The more ardent advocates of a double standard, too, attributed most of the continued trade depression to this cause. The altered condition of opinion on the question was seen at the monetary conference held at Paris in 1878, where the universal demonetization of silver was considered to be dangerous. The "Bland Act" of the United States, which theoretically decreed the double standard (1878), was another instance of reaction. The great depreciation of silver, which resulted mainly from its having ceased to be money over a large part of the civilized world, severely affected the Indian finances, and thus the advocates of a double standard were able to command some attention in England. The conference held in Paris in 1881 reflected these changed views. The supporters of the double standard took the initiative and proposed a treaty based on the double standard at a fixed ratio, but no conclusion was arrived at—England, Germany, and the Scandinavian Union upholding the gold standard.

MONFERRATO, or MONTFERRAT, an ancient marquisate of North Italy, in the valley of the Tanaro, the name of which still survives in the fuller title (Casale Monferrato) of the town of Casale. The princes of Monferrato were among the most powerful Italian families of the Middle Ages.

MONGE, GASPARD, a French mathematician, the inventor of descriptive geometry, was born at Beaune on May 10, 1746.

In 1768 Monge became professor of mathematics, and in 1771 professor of physics, at Mézières; in 1778 he married Madame Horbon, a young widow whom he had previously defended in a very spirited manner from an unfounded charge; in 1780 he was appointed to a chair of hydraulics at the Lyceum in Paris (held by him together with his appointments at Mézières), and was received as a member of the Academy; his intimate friendship with Berthollet began at this time. In 1783, quitting Mézières, he was, on the death of Bezout, appointed examiner of naval candidates.

Monge contributed (1770-1790) to the *Memoirs* of the Academy of Turin, the *Mémoires des Savants Étrangers* of the Academy of Paris, the *Mémoires* of the same Academy, and the *Annales de Chimie*, various mathematical and physical papers.

In 1792, on the creation by the Legislative Assembly of an executive council, Monge accepted the office of minister of the marine, but retained it only until April, 1793. When the Committee of Public Safety made an appeal to the savants to assist in producing the *matériel* required for the defense of the republic, he applied himself wholly to these operations, and distinguished himself by his indefatigable activity therein; he wrote at this time his *Description de l'art de fabriquer les canons*, and his *Avis aux ouvriers en fer sur la fabrication de l'acier*. He took a very active part in the measures for the establishment of the Normal School (which existed only during the first four months of the year 1795), and of the School for Public Works, afterward the Polytechnic School, and was at each of them professor for descriptive geometry; his methods in that science were first published in the form in which the shorthand writers took down his lessons given at the Normal School in 1795, and again in 1798-99. In 1796 Monge was sent into Italy with Berthollet and some artists to receive the pictures and statues levied from several Italian towns, and made there the acquaintance of General Bonaparte. Monge was appointed president of the Egyptian commission, and resumed his connection with the Polytechnic School. His later mathematical papers are published (1794-1816) in the *Journal* and the *Correspondance* of the Polytechnic School. On the formation of the Senate he was appointed a member of that body, with an ample provision and the title of count of Pelusium; but on the fall of Napoleon he was deprived of all his honors, and even excluded from the list of members of the reconstituted Institute. He died at Paris on July 28, 1818.

MONGHYR, or MUNGIR, a district in the lieutenant-governorship of Bengal, with an area of 3,922 square miles. The Ganges divides the district into two portions. The northern, intersected by the Burī, Gandak, and Tiljagā, two important tributaries of the Ganges, is always liable to inundation during the rainy season, and is a rich, flat, wheat and rice country, supporting a large population. The population of Monghyr is 1,812,986.

MONGHYR, chief town and administrative headquarters of the above district, is situated on the south bank of the Ganges. The population (1901) was 35,883.

MONGOLS. The early history of the Mongols, like that of all central-Asian tribes, is extremely obscure. Even the meaning of the name "Mongol" is a disputed

point, though a general consent is now given to Schott's etymology of the word from "mong," meaning brave. From the earliest and very scanty notice we have of the Mongols in the history of the T'ang dynasty of China (A. D. 619-90) and in works of later times, it appears that their original camping-grounds were along the courses of the Kerulon, Upper Nonni, and Argun rivers. But in the absence of all historical particulars of their origin, legend, as is usual, has been busy with their early years. The soberest story on record is that their ancestor Budantsar was miraculously conceived of a Mongol widow. By craft and violence Budantsar gained the chieftainship over a tribe living in the neighborhood of his mother's tent, and thus left a heritage to his son. Varying fortunes attended the descendants of Budantsar, but on the whole their power gradually increased, until Yesukai, the father of Jenghiz Khan, who was eighth in descent from Budantsar, made his authority felt over a considerable area. How this dominion was extended under the rule of Jenghiz Khan has already been shown (see JENGHIZ KHAN), and when that great conqueror was laid to rest in the valley of Keleen in 1227 he left to his sons an empire which stretched from the China Sea to the banks of the Dnieper.

In 1235, Ogdoi, whose troops were as numerous as their thirst for conquest was devouring, dispatched three armies in as many directions. One was directed against Corea, one against the Sung dynasty, which ruled over the provinces of China south of the Yang-tze-Keang, and the third was sent westward into eastern Europe. With irresistible vigor and astonishing speed the Mongols made their way through the forests of Penza and Riazan. For five days they discharged a ceaseless storm of shot from their ballistas, and having made a breach in the defenses, carried the city by assault on December 21, 1237. Moscow, at this time a place of little importance, next fell into the hands of the invaders, who then advanced against Vladimir. After having held out for several days against the Mongol attacks, the city at length succumbed, and the horrors of Riazan were repeated. The imperial family, with a vast crowd of fugitives, sought shelter in the cathedral, only to perish by the swords of the conquerors or by the flames which reduced it to ashes.

Victorious and always advancing, the Mongols, having desolated this portion of Russia, moved on in two divisions, one under Batu into Hungary, and the other under Baidar and Kaidu into Poland. Without a check, Batu marched to the neighborhood of Pesth, where the whole force of the kingdom was arrayed to resist him. While the careless Hungarians were sleeping he launched his battalions into their midst. Panic-stricken and helpless, they fled in all directions, followed by their merciless foes. Two archbishops, three bishops, and many of the nobility were among the slain, and the roads for two days' journey from the field of battle were strewn with corpses. Meanwhile Batu captured Pesth, and on Christmas day, 1241, the ruling monarch having crossed the Danube on the ice, took Gran by assault. While Batu had been thus triumphing, the force under Baidar and Kaidu had carried fire and sword into Poland. At their approach the inhabitants of Cracow deserted the city, after having given it over to the flames. Disappointed at the loss of their expected spoil, the Mongols advanced to Wahlstatt in the neighborhood of Liegnitz, where the Polish army under Duke Henry II. of Silesia awaited their onslaught. With savage impetuosity, the troops of Baidar rushed to the attack, and completely defeated the Poles.

While his lieutenants had been thus carrying his arms in all directions, Ogdoi had been giving himself up to

ignoble ease and licentiousness. Like many Mongols, he was much given to drink, and it was to a disease produced by this cause that he finally succumbed, on December 11, 1241. He was succeeded by his son Kuyuk, who reigned only seven years.

On July 1, 1251, Mangu, the eldest son of Tulé and nephew to Ogdai, was elected khakan. With perfect impartiality, Mangu allowed the light of his countenance to fall upon the Christians, Mohammedans, and Buddhists among his subjects, although Shamanism was recognized as the state religion. On his accession complaints reached Mangu that dissensions had broken out in the province of Persia, and he therefore sent a force under the command of his brother Hulagu to punish the Ismailites or Assassins, who were held to be the cause of the disorder. Marching by Samarkand and Kesh, Hulagu crossed the Oxus and advanced by way of Balkh into the province of Kohistan. Hulagu then marched across the snowy mountains in the direction of Baghdad. On arriving before the town he demanded its surrender. This being refused, he laid siege to the walls in the usual destructive Mongol fashion, and at length, finding resistance hopeless, the caliph was induced to give himself up and to open the gates to his enemies. On February 15, 1263, the Mongols entered the walls, and, following their instincts, sacked the city. For several days it was given up to pillage, fire, and the sword, and the number of killed was said to have reached the enormous sum of 800,000. For the moment the caliph's life was spared, and he was allowed to carry away 100 wives out of 700 who lived in his harem. But his fate soon overtook him. Accounts differ as to the circumstances of his death, some saying that he was sewn up in a sack and trodden to death by horses, others that he was starved to death. To the Moslem world his loss was a religious catastrophe, as by it Islam lost its spiritual head. One terrible result of the Mongol invasion was a fearful famine, which desolated the provinces of Irak-Arabi, Mesopotamia, Syria, and Rûm. But, though the inhabitants starved, the Mongols had strength and energy left to continue their onward march into Syria. Aleppo was stormed and sacked, Damascus surrendered, and Hulagu was meditating the capture of Jerusalem with the object of restoring it to the Christians when he received the news of Mangu's death, and, as in duty bound, at once set out on his return to Mongolia, leaving Kitubuka in command of the Mongol forces in Syria. As a reward for his services, Hulagu received the investiture of his conquests, and established there the empire of the Ilkhans.

While Hulagu was prosecuting these conquests in western Asia, Mangu and his next brother Kublai were pursuing a like course in southern China. Southward they even advanced into Tong-king, and westward they carried their arms over the frontier into Tibet.

At the Kuriltai, or assembly of notables, which was held at Shang-tai after the death of Mangu, his brother Kublai (see KUBLAI KHAN) was elected khakan. For thirty-five years he sat on the Mongol throne, and at his death in 1294, in his seventy-ninth year, he was succeeded by his son Timur Khan, or, as he was otherwise called, Uldsheitu Khan. Uldsheitu was succeeded by his nephew Khaissan, known as Kuluk Khan. After a short reign, and at the early age of thirty-one, Kuluk was gathered to his fathers in February, 1311. His nephew and successor, Buyantu, was a man of considerable culture, and substantially patronized Chinese literature. After a reign of nine years Buyantu was succeeded by his son Gegen, who perished in 1323 by the knife of an assassin—the first occasion on which a reigning descendant of Jenghiz Khan thus met his fate.

Yissun Timur, who was the next sovereign, devoted himself mainly to the administration of his empire. He divided China, which until that time had been apportioned into twelve provinces, into eighteen provinces, and rearranged the system of state granaries, which had fallen into disorder.

The following years were years of great natural and political convulsions. Devastating floods swept over China, carrying death and ruin to thousands of homes; earthquakes made desolate whole districts; and in more than one part of the empire the banners of revolt were unfurled. The khakans who now successively occupied the throne, instead of striving to stem the tide of discontent and disorder, gave themselves up to every kind of debauchery. As a natural consequence, the conduct of affairs fell entirely into the hands of their ministers, who but too often reflected the vices of their sovereigns.

In 1355 a Buddhist priest named Choo Yuen-chang became so impressed with the misery of his countrymen that he threw off his vestments and enrolled himself in the rebel army. His military genius soon raised him to the position of a leader, and with extraordinary success he overcame, with his rude levies, the trained legions of the Mongol emperor. For a time the western provinces of China continued to hold out against the rebels, but with the flight of Toghon Timur the Mongol troops lost heart, and in 1368 the ex-Buddhist priest ascended the throne as the first sovereign of the Ming or "Bright" dynasty, under the title of Hung-woo.

Thus ended the sovereignty of the house of Jenghiz Khan in China. Not content with having recovered China, the emperor Hung-woo sent an army of 400,000 men into Mongolia in pursuit of the forces which yet remained to the khakan. Even on their own ground the disheartened Mongols failed in their resistance to the Chinese, and at all points suffered disaster. Meanwhile Toghon Timur, who did not long survive his defeat, was succeeded in the khakanate by Biliktu Khan, who again in 1379 was followed by Ussakhal Khan. During the reign of this last prince, the Chinese again invaded Mongolia, and inflicted a crushing defeat on the khan's forces in the neighborhood of Lake Buyur.

The Mongol royal family and their immediate surroundings occupied the Chakhar country to the northwest of the Ordus territory, where they became eventually subjugated by the Manchus on the overthrow of the Ming dynasty in 1644 by the present rulers of China.

But while China was thus overcoming the Mongols within her reach, Russia was gathering within her borders those with whom she came into contact. Among these were the Buriats, who occupied a large territory on both sides of the Baikal Lake. As usual in such cases, disputes arose out of disturbances on the frontier, and were ended by the Buriats and the neighboring Mongol tribes becoming one and all tributary to Russia. Of the Mongol tribes who became entirely subject to Russia the principal are those of the Crimea, of Kasan, and of Astrakhan; of these the Tatars of Kasan are the truest representatives of the Golden Horde or Kipchaks, who originally formed the subjects of Batu and Orda. Batu, whose victorious campaign in Russia has already been sketched, was finally awarded as his fief the vast steppes which stretch from the Carpathian Mountains to the Balkash Lake. Over these vast plains the Mongols followed their flocks and herds, while the more settled among them established themselves along the banks of the rivers which flow through that region. Batu himself fixed his headquarters on the Volga, and there set up his Golden

rent from which the horde acquired the name of the Golden Horde. In 1255 Batu died and was succeeded by his brother Bereke Khan. During the reign of this sovereign the exactions which were demanded from the Russian Christians by the Mongols aroused the Christian world against the barbarian conquerors, and at the command of Pope Alexander IV. a general crusade was preached against them. But though the rage of the Christians was great, they lacked that united energy which might have availed them against their enemies; and, while they were yet breathing out denunciations, a Tartar host, led by Nogai and Tulabagha, appeared in Poland. After a rapid and triumphant march, the invaders took and destroyed Cracow, and from thence advanced as far as Bythom in Oppeln, from which point they eventually retired, carrying with them a crowd of Christian slaves. From this time the Mongols became for a season an important factor in European politics. They corresponded and treated with the European sovereigns, and intermarried with royal families.

The adoption of Islam by the rulers of the Golden Horde had as one result the drawing closer of the relations of the Mongols with Constantinople and Egypt. Embassies passed between the three courts, and so important was the alliance with the Mongols deemed by the sultan Násir, ruler of Egypt, that he sent to demand in marriage a princess of the house of Jenghiz Khan. At first his request was refused by the proud Mongols; but the present of a million gold dinars, besides a number of horses and suits of armor, changed the refusal into an acquiescence, and in October, 1319, the princess landed at Alexandria in regal state. With all their love of war the Mongols had a keen eye to monetary advantage, and Janibeg, who was no exception to the rule, concluded treaties with the merchant-princes of Venice and Genoa, in which the minute acquaintance displayed with shipping dues and customs charges shows how great were the advances the Mongols had made in their knowledge of European commerce since the days of Jenghiz Khan. The throne Janibeg had seized by violence was, in 1357, snatched from him by violence.

But while the power of the Golden Horde was dwindling away, the White Horde or Eastern Kipchak, which was the inheritance of the elder branch of the family of Juchi, remained prosperous and full of vitality. The descendants of Orda, Batu's elder brother, being far removed from the dangerous influence of European courts, maintained much of the simplicity and vigor of their nomad ancestors, and the throne descended from father to son with undiminished authority until the reign of Urus Khan (1360), when complications arose which changed the fortunes of the tribe. Like many other opponents of Mongol rulers, Khan Tuli Khoja paid with his life for his temerity in opposing the political schemes of his connection Urus Khan. Toktamish, the son of the murdered man, fled at the news of his father's death and sought refuge at the court of the famous Timur-i-leng (Tamerlane), who received him with honor and at once agreed to espouse his cause.

Toktamish now seized the throne, not only of Eastern Kipchak but also of the Golden Horde, over which his arms had at the same time proved victorious. His demands for tribute from the Russian princes met with evasions from men who had grown accustomed to the diminished power of the later rulers of the Golden Horde, and Toktamish therefore at once marched an army into Russia. Having captured Serpukhoff, he advanced on Moscow. On August 23, 1382, his troops appeared before the doomed city. For some days the inhabitants bravely withstood the constant attacks on

the walls, but failed in their resistance to the stratagems which were so common a phase in Mongolian warfare. Without discriminating age or sex, the Mongol troops butchered the wretched inhabitants without mercy, and, having made the streets desolate and the houses tenantless, they first plundered the city and then gave it over to the flames. The same pitiless fate overtook Vladimir, Zvenigorod, Yurieff, Mozhaïsk, and Dimitroff. In 1395 Timur found it necessary again to undertake a campaign against Toktamish. This time the armies met upon the Terek, and after a fiercely-contested battle the Kipchaks again fled in confusion. The pursuit along the Volga was vigorously undertaken, and the slaughter among the fugitives was terrible. The hurried advance of Timur's horsemen threw the Russians into a state of wild alarm, and the grand prince of Moscow ordered that an ancient image of the Virgin which was believed to possess miraculous power should be taken to Moscow to save that city from the destroyer. Success appeared to attend this measure, for Timur, threatened by the advancing autumn, gave up all further pursuit, and retired with booty. On his homeward march southward he arrived before Azak, which was then the entrepôt where the merchants of the east and west exchanged their wares. In vain the natives, with the Egyptian, Venetian, Genoese, Catalan, and Basque inhabitants, besought him to spare the city. His answer was a command to the Moslems to separate themselves from the rest of the people, whom he put to the sword, and then gave the city over to the flames. Circassia and Georgia next felt his iron heel, and the fastnesses of the central Caucasus were one and all destroyed. One solitary fragment of the Golden Horde, the khanate of Astrakhan, maintained for a time an existence after the fall of the central power. But even this last remnant ceased to be a Mongol apapage in 1554, when it was captured by the Russians and converted into a Russian province. The fate which thus overtook the Golden Horde was destined to be shared by all the western branches of the great Mongol family. The khans of Kasan and Kasimoff had already in 1552 succumbed to the growing power of Russia, and the Krim Tartars were next to fall under the same yoke.

MONGOOS, or MUNGOOS. See ICHNEUMON.

MONITION, in the practice of the English ecclesiastical courts, is an order requiring or admonishing the person complained of to do something specified in the monition, "under pain of the law and penalty thereof." It is the lightest form of ecclesiastical censure, but disobedience to it, after it has been duly and regularly served, entails the penalties of contempt of court.

MONK, GEORGE, English general, was born in Devonshire, December 6, 1608. An exploit which brought him within the reach of the law compelled him to begin his career as a soldier of fortune at the age of seventeen. He acted under Sir R. Grenville as a volunteer in the expedition to Cadiz, and the next year did notable service at the Isle of Rhé. In 1629 Monk went to the Low Countries, the training ground for military men, where in Oxford's and in Goring's regiments he obtained a high reputation for courage. In 1638 he threw up his commission in consequence of a quarrel with the Dutch civil authorities, returned to England, and obtained the lieutenant-colonelcy of Newport's regiment during the operations on the Scottish border. Here he showed his skill and coolness in the dispositions by which he saved the English artillery at Newborn, though himself destitute of ammunition; and in the councils of war he confidently voted with Strafford for fighting, and against retreat or composition. The Irish rebellion now called for his service, and in February, 1641, he landed at Dublin.

as colonel of Lord Leicester's regiment. Here he greatly increased his reputation. The governorship of Dublin was vacant, and Monk was appointed by Leicester. But Charles I. overruled the appointment in favor of Lord Lambert. Monk now deemed it safest to affect Royalist views. His value caused him to be received at once into Charles' confidence; he was appointed major-general of the Irish brigade, and served under Byron at the siege of Nantwich. Here he was taken prisoner by Fairfax, on January 25, 1644. After a short captivity in Hull he was placed in the Tower, where he remained for three years (during which his father died,) beguiling his imprisonment by writing his *Observations on Military and Political Affairs*.

So long as the war lasted Monk could not be released. Charles, however, became a prisoner; the troubles in Ireland made the parliament anxious to secure Monk's services, and he was told that if he would take the Covenant he might have an important command. With some show of hesitation the terms were accepted, and, after a service of two months in Lord Lisle's abortive expedition, Monk was placed in command of the British forces in the north of Ireland. Compelled in 1649 to conclude a pacification with the rebel O'Neill, he returned to England after the king's execution. In the same year he succeeded, by his elder brother's death, to the family estate. His idleness lasted but a short while. Cromwell gave him a regiment and the command of the ordnance in the Scotch war of 1650, and after the battle of Dunbar, in which he led the attack, he was left with 6,000 men to subdue the country, which, after taking Edinburgh, Tantallon, and Stirling castles, he did most completely in a few weeks. In 1653, with Admiral Dean, he commanded the British fleet against the Dutch, and on June 2d and 3d and July 29th fought two of the most sanguinary naval battles on record, in which both his colleague and Van Tromp were slain. A peace on very humiliating terms to the Dutch was concluded, but policy shortly led Cromwell to allow milder conditions—a concession against which Monk strongly remonstrated. On his return he married his mistress, Anne Clarges, a woman of the lowest extraction. Monk was now sent to quell the revolt headed by Middleton in Scotland, and, when this service was over, settled down to a steady government of the country for the next five years. For fanaticism in any shape he had no sympathy, and he set himself to diminish the influence of the Presbyterian clergy—Cromwell's chief opponents—taking from them the power of excommunication and their general assemblies, but allowing them to retain their presbyteries. Equal repression was exercised against the nobility and gentry. The timely discovery of a plot fomented by Overton for killing Monk on New Year's Day gave him an excuse for thoroughly purging his army of all Anabaptists, Fifth Monarchy men, and other dangerous enthusiasts. It is doubtful whether at this time Monk had proposed to himself the restoration of the king. He probably had it always in his mind as a possibility, but he would run no risks. His very reticence, however, caused alarm on one side and hope on the other.

During the confusion which followed Cromwell's death Monk remained silent and watchful at Edinburgh, careful only to secure his hold on his troops. In July, 1659, direct and tempting proposals were made to him by the king. His brother, Nicholas, a clergyman, was employed by Sir J. Grenvil to bring to him the substance of Charles' letter. No bribe, however, could induce him to act one moment before the right time. On October 17th, he heard of Lambert's *coup d'état*. From that moment his plan of action seems to have been settled. In most vehement language he discarded

the idea of restoring Charles, and with admirable perception of the state of English feeling took for his principles that in all cases the army must obey the civil government, and that the civil government must be parliamentary. At present the Rump was crushed by the military party; the first thing, therefore, to be done was to free it. His army underwent a second purging of disaffection, and he then issued a declaration embodying the principles mentioned above, and wrote to Lenthall the speaker, and to the military party to the same effect. In a treaty with the Committee of Safety his commissioners, who were to treat only on the basis of the restoration of parliament, were outwitted. Monk at once refused to accept the terms proposed, and march to Berwick, having received an offer from Fairfax of assistance if he would promise that the secluded members should be restored. Meanwhile Lambert had marched northward to oppose his advance.

Monk's action gave fresh heart to the adherents of the parliament. The old council of state met, and named him general of all the forces; the fleet and the Irish army, hitherto hostile, came round to his side, and so did Whetham at Portsmouth. Monk now, in the depth of winter, crossed the Tweed at Coldstream and marched by Morpeth to Newcastle. On his approach Lambert's army fell away from their general, and no obstacle remained on the path to London. At York, when urged by Fairfax, he refused to declare for the king, and is said to have named an officer who affirmed that such was his design. The parliament now ordered him to come to London. Fleetwood's army which occupied the city, was, however, a great obstacle; and it was not until the parliament, in accordance with his desire, had arranged for its dispersion that he would enter with his troops. Even now his intentions were strictly concealed; the spies set upon him by the various anxious parties were baffled by his impenetrable reserve. He was careful to appear only as the servant of parliament, but when he was desired to take the oath of abjuration he skillfully evaded the request. The city, always jealous of the Rump, now refused to pay taxes except at the orders of a free parliament. Monk, in consequence, was ordered to march his troops into the city, take down the chains and posts, and unhang the gates. He obeyed these unpleasant orders to the letter on February 10th, thus permitting the hatred against the Rump to rise to its height, while he showed how unwilling an instrument of its will he was. On the eleventh, however, he threw off the mask, and wrote to the Rump, peremptorily ordering them to admit the secluded members, and to arrange for the dissolution of parliament by May 6th. On February 21st, he conducted the secluded members to their seats. At the same time he refused to restore the Lords, and issued an order disowning Charles Stuart to all officers commanding garrisons. Every day brought him fresh opportunities for tact or evasion. His partisans urged him to take the protectorate himself; another party pressed upon him to accomplish the restoration by the army alone; a body of his officers sent him a declaration expressing their fears that his action would lead to the restoration of monarchy; the parliament tried to make him their own by the offer of Hampton Court. His trained habits of dissimulation and evasion, assisted now and again by downright lying, carried him triumphantly through all these dangers, and at length the dissolution of parliament on March 17th, removed his greatest difficulties.

It was now that, with the utmost secrecy, he gave an interview for the first time to the king's agent Grenvil, and by him sent to Charles the conditions of his restor-

tion, afterward embodied in the Declaration of Breda. For himself at present he would accept nothing but a royal commission as captain-general, which he carefully kept to himself. All parties were anxious to gain the credit of the now certain restoration. The Presbyterians in particular, fearful of the king being restored without terms, did their best to discredit Monk and to impose the old Isle of Wight conditions; but in vain. The new parliament was elected, and the House of Lords restored; an insurrection by Lambert, who had escaped from the Tower, was quelled by Monk's prompt measures, and on April 25th he received the solemn thanks of both Houses, and the title of captain-general of the land forces. Even yet the farce was kept up. Monk received with feigned surprise the king's official letter from Grenvil, denied all knowledge of its contents, and handed it over sealed to the council, who decided to defer opening it until the meeting of parliament on May 1st.

With the Restoration the historic interest of Monk's career ceases. The rude soldier of fortune had played the game with incomparable dexterity, and had won the stakes. He was made gentleman of the bedchamber, knight of the Garter, master of the horse, commander-in-chief, and duke of Albemarle, and had a pension of £7,000 a year allotted him. His utmost desires were satisfied, and he made no attempt to compete further in a society in which neither he nor his vulgar father could ever be at home, and which he heartily despised. As long as the army existed of which he was the idol, and of which the last service was to suppress Venner's revolt, he was a person not to be displeased. But he entirely concurred in the measure for disbanding it, and thenceforward his influence was small, though men's eyes turned naturally to him in emergency. In the trial of the regicides he was on the side of moderation, and his interposition saved Hazelrig's life; but his action at the time of Argyll's trial will always be regarded as the most dishonorable episode in his career. In 1664 he had charge of the admiralty when James was in command of the fleet, and when in 1665 London was deserted on account of the plague, Monk, with all the readiness of a man accustomed to obey without thinking of risk, remained in charge of the government of the city. Once more, at the end of this year, he was called upon to fight, having a joint commission with Prince Rupert against the Dutch. The whole burden of the preparations fell upon him. On April 23, 1666, the admirals joined the fleet and on June 1st began a battle near Dunkirk which lasted four days, followed by another on July 23d, in which Monk showed all his old coolness and skill, and a reckless daring which had seemed hitherto foreign to his character. His last service was in 1667, when the Dutch fleet sailed up the Thames, and Monk, ill as he was, hastened to Chatham to oppose their further progress. From that time he lived much in privacy, and died of dropsy on December 3, 1669.

MONKEY. See APE.

MONMOUTH, a maritime county of England, is bounded east by Gloucester, northeast by Hereford, northwest by Brecknock, west and southwest by Glamorgan, and south by the Bristol Channel. Its greatest length from north to south is about thirty-five miles, and its greatest breadth about twenty-eight miles. The area is 539 square miles; pop. (1901) 230,800.

MONMOUTH, a parliamentary and municipal borough of England, and the county town of Monmouthshire, is picturesquely situated at the confluence of the Wye and Monnow, in a valley almost surrounded by hills, 18 miles south of Hereford, and 128 west of London. Population (1901), about 8,000.

MONMOUTH, a small manufacturing city in Warren county, Ill., 180 miles southwest of Chicago. Population (1900), 7,460.

MONMOUTH, JAMES, DUKE OF, was the son of Lucy Walters, "a brown, beautiful, bold, but insipid creature," who became the mistress of Charles II. during his exile at the Hague. He was born at Rotterdam, April 9, 1649. That Charles was his father is more than doubtful, for Lucy Walters had previously lived with Robert Sidney, brother of Algernon, and the boy resembled him very closely. No formal acknowledgment of his relation to the king was made until his betrothal to Anne Scott, daughter of the earl of Buccleuch, and the wealthiest heiress of Scotland, whom he married in 1665. During 1663 he was made duke of Orkney, duke of Monmouth, and knight of the Garter, and received honorary degrees at both universities. At court he was treated as a prince of the blood. Soon after 1670 the anti-papery spirit became a frenzy, and the succession of James a probability and a terror. Charles was urged to legitimize Monmouth by a declaration of his marriage with Lucy Walters. He returned answer that, much as he loved the duke, he would rather see him hanged at Tyburn than own him for his legitimate son. Every attempt, however, was henceforth made, especially by Shaftesbury, to accustom people to this idea. He was taught to regard himself as the representative of the Protestant interest, and his position was emphasized by James' second marriage with the Roman Catholic princess Mary of Modena. From this time his popular title was "the Protestant duke." Charles was induced to confer many prominent employments upon him. The influence of James, however, was strong enough to prevent his obtaining the lord-lieutenancy of Ireland; but he received the command of the 6,000 troops who assisted the French in the second Dutch war, and, though without any claims to generalship, behaved with courage in the field. In 1674 he was made "commander-in-chief;" and, in connection with this, another unsuccessful attempt, graphically described in Clarke's *Life of James*, was made to gain from Charles a tacit admission of his legitimacy. At Shaftesbury's instance he was placed in command of the army employed in 1675 against the Scottish Covenanters, and was present at Bothwell Bridge (June 22, 1679). He was also, at the king's request, elected chancellor of the university of Cambridge. In 1678, when Charles was driven into war with Louis, Monmouth took the command of the English contingent, and again gained credit for personal courage at the battle of St. Denis. On his return to London England was in the throes of the popish terror. The idea of securing the Protestant succession by legitimizing Monmouth again took shape, and was eagerly pressed on by Shaftesbury; at the time it seemed possible that success would wait on the audacity.

James retired to Brussels, the king having previously signed a declaration that he "never was married, nor gave contract to any woman whatsoever but to my wife, Queen Catherine." In spite of this, Monmouth might naturally now nourish ambitious views. His rival was off the stage; Shaftesbury, his chief supporter, was president of the remodeled privy council; and he himself was the favorite of the city. In the summer of 1679 the king suddenly fell ill, and the dangers of a disputed succession became terribly apparent. The party opposed to Monmouth, or rather to Shaftesbury, easily prevailed upon Charles to consent to his brother's temporary return. When, after the king's recovery, James went back to Brussels, he received a promise that Monmouth too should be removed from favor and ordered to leave the country. Accordingly, in September, 1679,

the latter repaired to Utrecht, while shortly afterward James' friends so far gained ground as to obtain for him permission to reside at Edinburgh instead of at Brussels. Within two months of his arrival at Utrecht, Monmouth secretly returned to England, arriving in London on November 27th. Shaftesbury had assiduously kept alive the anti-papery agitation, and Monmouth, as the champion of Protestantism, was received with every sign of popular delight. The king appeared to be greatly incensed, deprived him of all his offices, and ordered him to leave the kingdom at once. This he refused to do, and the only notice taken of the disobedience was that Charles forbade him to appear at court.

It is probable that Monmouth never went so far as to think of armed rebellion; but there is little doubt that he had talked over schemes likely to lead to this, and that Shaftesbury had gone further still. The Rye House plot gave an excuse for arresting the Whig leaders; Russell and Sidney were judicially murdered; Monmouth retired to Toddington in Bedfordshire, and was left untouched. Court intrigue favoring him, he succeeded, by the betrayal of his comrades and by two submissive letters, in reconciling himself with the help of Halifax both to the king and to James, though he had the humiliation of seeing his confessions and declarations of penitence published at length in the *Gazette*.

Monmouth was subpoenaed to give evidence at the trial of young Hampden. To escape from the difficulties thus opened before him he fled to Holland, probably with Charles' connivance, and, though he once more, in November, 1684, visited England, it is doubtful whether he ever again saw the king. From that time till the king's death he lived with Henrietta Wentworth, his mistress, in Holland and at Brussels.

The quiet accession of James II. soon brought Monmouth to the crisis of his fate. Though at first desirous of retirement, his character was too weak to withstand the urgency of more determined men.

On May 2d Argyll sailed with three ships to raise the west of Scotland; and three weeks later, with a following of only eighty-two persons, Monmouth himself set out for the west of England, where, as the stronghold of Protestant dissent and as the scene of his former progresses, he could alone hope for immediate support. Even here, however, there was no movement; and when on June 11th Monmouth's three ships, having eluded the royal fleet, arrived off Lyme Regis, he landed amid the curiosity rather than the sympathy of the inhabitants. In the market-place his "declaration," drawn up by Ferguson, was read aloud. In this document James was painted in the blackest colors. Not only was he declared to be the murderer of Essex, but he was directly charged with having poisoned Charles to obtain his crown. Monmouth soon collected an undisciplined body of some 1,500 men, with whom he seized Axminster and entered Taunton. Meanwhile the parliament had declared it treason to assert Monmouth's legitimacy, or his title to the crown; a reward of £5,000 was offered for him dead or alive, and an act of attainder was passed in unusual haste. Troops had been hurriedly sent to meet him, and, when he reached Bridgwater, Albemarle was already in his rear. From Bridgwater the army marched through Glastonbury to attack Bristol, into which Lord Feversham had hastily thrown a regiment of foot-guards. The attempt, however, miscarried; and, after summoning Bath in vain, Monmouth, with a disordered force, began his retrograde march through Phillips-Norton and Frome, continually harassed by Feversham's soldiers. At the latter place he heard of Argyll's total rout in the western Highlands. He was now anxious to give up

the enterprise, but was overruled by Grey, Wade, and others. On July 3d he reached Bridgwater again, with an army little better than a rabble, living at free quarters and behaving with reckless violence. On Sunday, the 5th, Feversham entered Sedgemoor in pursuit; Monmouth the same night attempted a surprise, but his troops were hopelessly routed. He himself, with Grey and a few others, fled over the Mendip Hills to the New Forest, hoping to reach the coast and escape by sea. The whole country, however, was on the alert, and at midnight on the 8th, within a month of their landing, James heard that the revolt, desperate from the first, was over, and that his rival had been captured close to Ringwood, in Hampshire.

The poor strain in Monmouth's character was now shown. On the day of his capture he wrote to James in terms of the most unmanly contrition, ascribing his wrong-doings to the action of others, and imploring an interview. On the 13th the prisoners reached the Tower, and on the next day Monmouth was allowed to see James. The accounts of this interview are difficult to reconcile in some points, but all agree that Monmouth's behavior was unmanly in the extreme. No mercy was shown him, nor did he in the least deserve mercy; he had wantonly attacked the peace of the country, and had cruelly libeled James. The king had not, even in his own mind, any family tie to restrain him from exercising just severity, for he had never believed Monmouth to be the son of any one but Robert Sidney. He offered, as the last hope, to become a Roman Catholic, and this might possibly have proved successful, but the priests sent by James to ascertain the sincerity of his "conversion" declared that he cared only for his life and not for his soul.

He met his death on the scaffold with calmness and dignity. In the paper which he left signed, and to which he referred in answer to the questions wherewith the busy bishops plied him, he expressed his sorrow for having assumed the royal style, and at the last moment confessed that Charles had denied to him privately, as he had publicly, that he was ever married to Lucy Walters. He died at the age of thirty-six, on July 15, 1685.

MONMOUTH, GEOFFREY OF. See **GEOFFREY OF MONMOUTH**.

MONOPHYSITES. See **EUTYCHES** and **JACOBITE CHURCH**.

MONOPOLI, a city of Italy, in the province of Bari, is situated on the coast of the Adriatic, twenty-five miles by rail southeast of Bari. Population, 21,000.

MONOPOLY. The original Greek meaning of this word applies strictly to the grant, by the reigning sovereign to a subject, of the right to sell some one article, to the exclusion of all competitors, or, of the right to the exclusive use of some one product. It may well be held that a **PATENT** (*q.v.*) is a *monopoly*—defined and terminable, but still a matter of exclusive manufacture and sale. **COPYRIGHT** (*q.v.*) in books is also a monopoly, but guarded by legislation. It was not until about the reign of Henry VIII., of England, that grants of monopolies of inventions or special articles of trade were made to any extent. Elizabeth granted patents of monopoly so freely that the practice became an abuse. From table forks to playing cards, everything in the nature of a new invention or introduction was granted to some hanger-on of court. The evil had attained such dimensions under James I. that in 1623 the Statute of Monopolies was passed. Since that time trade has been free in England, save for patents limited in their duration and copyrights (also limited), which are of the nature of patents.

But since the invention of labor-saving machinery.

and especially since the introduction of steam-machinery as a labor-saving factor, a new species of monopoly has grown up. With the death of the feudal system, under which the laborer preserved his individuality, subject only to the right of the lord to call upon him for war service and certain days' labor in lieu of rent, began the era of individualism. Prior to the introduction of machinery there existed a very large class of hand-workers, who, laboring in small shops or in their own homes, produced the textile fabrics, the products of iron and other metals, the manufactured foods and other necessities. With the invention of labor-saving machinery this class—the independent class of hand-workers—degenerated into the wage-workers and factory hands of the present day. Instead of an industrial army of individualists came an uncontrolled but helpless army of tenders of machinery—more helpless than the machines they tended. Capital, which of old was but the medium between the producer and the consumer, became the master of both.

It is in the United States that monopolies of all kinds have attained their fruition, and it is with their development in this country that the American people are chiefly concerned. Leaving out of consideration the postoffice monopoly (a species of State socialism which is acquiesced in by most countries), the whole system of inter-communication and of the transfer of products is in the hands of State-created monopolists. Attempts have been made, with more or less success, on the part of State legislatures, to limit the amount of tribute levied by these monopolies upon the producer and consumer, but not even the most aggressive granger legislature has as yet attempted the task of going to the root of the evil. The lion's claws have been pared; his permanent suppression has never been essayed.

Next to the railroad and express monopolies the telegraph monopoly must be reckoned as the third of the great quasi-public creations. We use the term monopoly advisedly in speaking of these, because all three exist by the consent and abetment of the State (in some cases of the nation), and could never have attained their present status without such consent and aid. The great railroads, especially the trans-continental lines, received vast grants of public lands from the United States, and the minor lines received State, county, and township bonds in aid of construction. Moreover, they invoked in every case the highest possible power of the State, the right of eminent domain, to secure their line of route. Creatures, therefore, of the State and of its subordinate entities, they should be the last to complain of State regulation, while as a matter of fact they have made themselves an *imperium in imperio*, defying all control.

The next and perhaps the most objectionable species of monopoly, and certainly the one which affords the most difficult problem of all, is the monopoly of the "trust" and the "combine." There is still some hope that by Federal or State legislation a limit may be put to the rapacity of the carrying and news-transmitting service. But the means by which to limit the grasping power of other chartered monopolies has not yet been discovered. Street railways, gas works, waterworks, and other organizations, acquire from municipalities the right to use streets, and to supply car service, water or gas to certain districts, thus forming a monopoly of the most stringent character. In many cases they obtain these franchises by indefensible means, the bribery of municipal officers being the chief. Having obtained them, the suppliant for a privilege becomes the master, and the interest of the public is lost entirely.

In addition to these must be mentioned the purely commercial "combines" and "trusts." These associations are not put to the expense of purchasing venal

municipal officers. They act by the power of capital alone. Their system is to acquire by purchase a controlling interest in some article of common use, for example, illuminating oil. Having purchased a majority of the oil-wells, for instance, they decree that the natural product of the wells shall be limited in order to raise the price. Small producers who dare to oppose the organization are driven out of the field by under-selling, and as soon as they are disposed of the consumer is charged whatever price the "combine" pleases. The same is true of sugar, twine, and scores of articles of common use.

MONOTHELITES (*monothelite*) was the name given to those who, in the seventh century, while otherwise orthodox, fell into the heresy of maintaining that Christ had only one will. The monothelite controversy had its origin in the efforts of the emperor Heraclius to win back for the church and the empire the excommunicated and persecuted Monophysites or Eutychians of Egypt and Syria.

MONREALE, a contraction of "monte-reale," was so called from a palace built there by the Norman Roger I., king of Sicily. It is now a town of about 16,300 inhabitants, situated five miles inland from Palermo, on the slope of Mount Caputo.

MONROE, JAMES, fifth president of the United States, was born April 28, 1758, in the county of Westmoreland, Va. At the outbreak of the Revolutionary war, James Monroe was a student at the College of William and Mary, but left his studies in 1776 to join the continental army. He took part as lieutenant in the New Jersey campaign of that year, and was wounded at the battle of Trenton. The next year he served with the rank of captain on the staff of General William Alexander ("Lord Stirling"), but, thus being out of the line of promotion, he soon found himself without military employment. In 1780 he began the study of the law under the direction of Jefferson, then governor of Virginia. His intimacy with Jefferson at this time had probably a controlling influence upon his subsequent political career. He continued through all vicissitudes to possess the friendship and support of both Jefferson and Madison.

In 1782 Monroe was in the State legislature, and from 1783 to 1786 was a member of Congress. On retiring from Congress he entered upon the practice of the law at Fredericksburg, and was again elected to the legislature. In the Virginia convention of 1788 for the ratification of the constitution, he was among the opponents of that instrument; but his course was approved by the legislature of his State, which elected him United States senator in 1790 to fill the vacancy caused by the death of William Grayson. As senator he was a decided opponent of the Federalist administration. Nevertheless he was selected by Washington in 1794 as minister to France in place of Gouverneur Morris, a Federalist, recalled upon the request of the French Government. Being of the party which sympathized with the revolutionary struggle in France, it was expected that his appointment would be flattering to the government of that country, and would also conciliate the French party at home. The Government of the National Convention received Monroe with open signs of favor, and on his part he expressed his own and his country's sympathy with the French Republic with so much enthusiasm that Washington deemed his language not in keeping with the neutral policy which the administration had recently proclaimed. At about the same time John Jay had negotiated a treaty of amity and commerce with England which gave great umbrage to France. It was alleged that the earlier treaty of 1778 with France was violated by the stipulations of the Jay treaty;

and the Directory seemed disposed to make of this a *sans belli*. In this emergency it was believed by Washington and his advisers that Monroe failed to represent properly the policy of the government, and he was therefore recalled in 1796. In justification of his diplomatic conduct, he published the next year his *View*, a pamphlet of 500 pages. In 1799 he became governor of Virginia, and was twice reelected. In the meantime the Republican party had come into power, with Jefferson as president, and Monroe was again called upon to fill an important diplomatic station. He was commissioned on January 10, 1803, to act with Livingston, resident minister at Paris, in negotiating the purchase of New Orleans and the territory embracing the mouth of the Mississippi, which formed a part of the province of Louisiana, recently ceded by Spain to France. In view of the anticipated renewal of hostilities between England and France in 1803, Napoleon was anxious, for a consideration, to part with his new acquisition, which in the event of a war with England he would probably lose by conquest. The American commissioners met, therefore, with little difficulty in the accomplishment of their object. But, in the absence of instructions, they assumed the responsibility of negotiating the purchase not only of New Orleans but of the entire territory of Louisiana—an event that is hardly second in importance to any in the history of this country. Monroe was next commissioned as minister to England, to succeed Rufus King, who had resigned. In 1804 he undertook a mission to Madrid, with the object of negotiating the purchase of the Floridas; but in this he was unsuccessful, and returned to London in 1805. The next year he was joined in a commission with William Pinckney to negotiate a treaty with England to take the place of the Jay treaty, which expired in that year. Lords Auckland and Howick having been appointed on the part of England, a treaty was concluded on the last day of the year, which was perhaps more favorable to the United States than the Jay treaty; but, like the latter, it contained no provision against the impressment of American seamen. For this reason President Jefferson refused to submit it to the Senate for ratification, but sent it back for revision. In the meantime Canning had become foreign secretary in place of Fox, and refused to reopen the negotiation. Monroe returned to the United States in 1807, and, as in the case of his first French mission, he drew up a defense of his diplomatic conduct in England. In 1808 certain disaffected Republicans attempted to put Monroe forward as the candidate for the presidency, but as Virginia declared in favor of Madison, Monroe withdrew his name. In 1810 he was again in the legislature of his native State, and the next year its governor. But in this year he was called from the state to the national council, superseding Robert Smith as secretary of state in Madison's cabinet, and he took an active part in precipitating the war against England in 1812. On the retirement of Armstrong, after the capture of Washington in 1814, Monroe assumed the duties of the war department in addition to those of the state department, and by his energy and decision infused something of vigor into the conduct of the war. He was elected president in 1816, and was reelected in 1820 without opposition. The period of his administration (1817-25) has been called "the era of good feeling," for the reason that the party issues of the past were mostly dead, and new issues had not yet arisen. In the formation of his cabinet Monroe showed the soundness of his judgment, selecting for the leading positions J. Q. Adams, J. C. Calhoun, W. H. Crawford, and William Wirt. With these able advisers he devoted himself to the

economic development of the country, which *has* been so long retarded by foreign complication. As president, moreover, he was able to accomplish in 1819 the acquisition of the Floridas, which as minister to Spain he had failed to do in 1804, and to define the boundary of Louisiana, which he had been the agent in purchasing in 1803. But Monroe is best known to later generations as the author of the so-called "Monroe doctrine," a declaration inserted in his seventh annual message, December 2, 1823. It was the formulation of the sentiment, then beginning to prevail, that America was for the Americans. One of the principles of the neutral policy of the country, which had been established with much difficulty, had been that the United States would not interfere in European politics; and now this policy was held to include the converse as a necessary corollary—that is, that Europe should not interfere in American politics, whether in North America or South America. The occasion of proclaiming this doctrine was the rumored intervention of the Holy Alliance to aid Spain in the reconquest of her American colonies. President Monroe believed that such a policy entered upon by the allied continental powers of Europe would be dangerous to the peace and safety of the United States; he therefore declared that "we would not view any intervention for the purpose of oppressing them (the Spanish American states) or controlling in any manner their destiny, by any European power, in any other light than as the manifestation of an unfriendly disposition toward the United States." This declaration, together with the known hostility of England to such a project, was sufficient to prevent further action on the part of the Alliance. (See MONROE DOCTRINE.)

On the expiration of his presidential term Monroe retired to Oak Hill, his residence in Loudoun county, Va.; but at the time of his death, July 4, 1831, he was residing in New York.

MONROE, a city of the United States, county seat of Monroe county, Mich., lies thirty-two miles south-southwest of Detroit, on the Raisin river, three miles inland from Lake Erie, with which it has been connected by a ship-canal since 1843. It is a station on the Canada Southern, the Flint and Père Marquette, and the Detroit division of the Lake Shore and Michigan Southern Railways. Agricultural implement factories, a spoke and hub factory, foundries and engineering-works, carriage-works, grist-mills, paper-mills, and fruit-drying establishments are in operation. From 400 to 500 tons of grapes are shipped yearly from the neighboring vineyards, and over 100,000 gallons of wine are made here. The population (1900) was 5,043. Settled as Frenchtown by a body of Canadians in 1784, Monroe received its present name, in honor of President Monroe, in 1817. Its city charter dates from 1837. It was the scene of the battle of the river Raisin, January 22, 1813.

MONROE DOCTRINE. The policy of the United States in regard to foreign affairs was first proclaimed by President Washington, and was re-asserted by President Monroe. Warned by the unfortunate course of the first French Republic, which entered upon a propaganda of republicanism with most disastrous results, the great Republic of the West declared that while anxious to preserve peace and friendship with all nations it would make entangling alliances with none. There is no doubt that Jefferson shared the views of Washington with respect to the advisability of refraining from foreign complications, and that he also held firmly to the doctrine that while the United States would not interfere with other nations, no interference by foreign governments with American affairs would be tolerated.

But it was reserved for James Monroe, fifth President of the United States, to formulate the doctrine which, universally accepted at the time, has grown and strengthened with years, and which to-day more than ever stands as the American policy. It was in 1823, when the Holy Alliance ruled in Europe and the Spanish-American countries rose in rebellion against their European masters, that the occasion came. Great Britain and the United States had acknowledged the independence of the revolted States. It was thought probable that the Holy Alliance would attempt by force to restore the Spanish control, and Monroe in a message to congress, designed to reach further than to its nominal address, enunciated the policy of the United States in the following words:

"We owe it, therefore, to candor and to the amicable relations existing between the United States and the allied powers to declare that we should consider any attempt on their part to extend their system to any part of this hemisphere as dangerous to our peace and safety. With the existing colonies or dependencies of any European power we have not interfered and shall not interfere, but with the governments who have declared their independence and maintained it, and whose independence we have on great consideration and just principles acknowledged, we could not view any interposition for the purpose of oppressing them, or controlling in any other manner their destiny by any European power in any other light than as the manifestation of an unfriendly disposition toward the United States."

This authoritative statement of the position of the United States had the desired effect. John Q. Adams, when president, proposed the holding of a Congress of the South and Central American republics, but the proposition came to nothing. But the underlying principle has become incorporated in the national life. It shaped the policy of the nation in regard to the Mexican situation in 1867, and it has led in later days to the calling of the Pan-American Congress, the results of which are still in embryo. For good or for evil the Monroe doctrine has been adopted as the American doctrine, and its force lies in the fact that it is supported by public opinion.

MONROVIA. See LIBERIA.

MONS, a town of Belgium, the capital of the province of Hainault, on the rivers Haine and Trouille, and thirty-one miles southwest of Brussels. The population in 1901 was 25,483.

MONSTER. Monsters or monstrous births are the subject of animal teratology, a department of morphological science treating of deviations from the normal development of the embryo. The term "embryo" is conventionally limited, in human anatomy, to the ovum in the first three months of its intra-uterine existence, while it is still developing or acquiring the rudiments of its form, the term "fœtus" being applied to it in the subsequent months during which the organism grows on the lines of development already laid down. It is mostly in the first or embryonic period that those deviations from the normal occur which present themselves as monstrosities at the time of birth; these early traces of deviation within the embryo may be slight, but they "grow with its growth and strengthen with its strength," until they amount to irreparable defects or accretions, often incompatible with extra-uterine life. The name of "teratology," introduced by Étienne Geoffroy St. Hilaire (1822), is derived from the Greek *teras*, the equivalent of *monstrum*; teratology is a term new enough to have none but scientific associations, while the Latin word has a long record of superstitions identified with it. The myths of siren, satyr, Janus, cyclops, and the like, with the corresponding figures in

Northern mythology, find a remote anatomical basis in monstrosities which have, for the most part, no life except in the foetal state. The mythology of giants and dwarfs is, of course, better founded. Although monstrosities, both in the human species and in other animals, tend to repeat certain definite types of erroneous development, they do not fall readily into classes. It is remarked by Vrolik that scientific classification is impracticable from being too cumbrous, and that a convenient grouping is all that need be attempted.

The abnormality may extend to the body throughout, as in well-proportioned giants and dwarfs; or it may affect a certain region or member, as—to take the simplest case—when there is a finger or toe too many or too few. It is very common for one malformation to be correlated with several others, as in the extreme case of acardiac monsters, in which the non-development of the heart is associated with the non-development of the head and with other radical defects.

Giants are conventionally limited to persons over seven feet in height. The normal proportions of the frame are adhered to more or less closely, except in the skull, which is relatively small; but accurate measurements, even in the best-proportioned cases, prove, when reduced to a scale, that other parts besides the skull, notably the thigh-bone and the foot, may be undersized though overgrown.

Dwarfs are conventionally limited to persons under four feet. They are more likely than giants to have the modulus of the body perfect. As in the case of giants, dwarfs are seldom the progeny of dwarfs, who are, in fact, usually sterile; the unnatural smallness may be obvious at birth, but is more likely to make itself manifest in the years of growth. Dwarfs are much more easily brought up than giants, and are stronger and longer lived; they have usually also strong passions and acute intelligence. The legends of the dwarfs and giants are on the whole well based on fact.

Imperfect closure along either of the embryonic lines of junction may produce various degrees of monstrosity. The simplest and commonest form, hardly to be reckoned in the present category, is harelip with or without cleft palate, which results from defective closure of the ventral laminae at their extreme upper end. Another simple form, but of much more serious import, is a gap left in the neural canal at its lower end; usually the arches of the lumbar vertebrae are deficient, and the fluid that surrounds the spinal cord bulges out in its membranes, producing a soft tumor under the skin at the lower part of the back. This is the condition known as *hydrohachis*, depending on the osseous defect known as *spina bifida*. Children born with this defect are difficult to rear, and are very likely to die in a few days or weeks. More rarely the gap in the arches of the vertebrae is in the region of the neck. If it extend all along the back, it will probably involve the skull also. Deficiency of the crown of the head, and in the spine as well, may be not always traceable to want of formative power to close the canal in the middle line; an over-distended condition of the central water canal and water spaces of the cord and brain may prevent the closure of the bones, and ultimately lead to the disruption of the nervous organs themselves, and injuries to the mother, with inflammation set up in the fœtus and its appendages, may be the more remote cause. But it is by defect in the middle line that the mischief manifests itself, and it is in that anatomical category that the malformations are included. The osseous deficiency at the crown of the head is usually accompanied by want of the scalp, as well as of the brain and membranes. The bones of the face may be well developed, and the features regular, except that

the eyeballs bulge forward under the closed lids; but there is an abrupt horizontal line above the orbits where the bones cease, the skin of the brow joining on to a spongy kind of tissue that occupies the sides and floor of the cranium. This is the commonest form of an *anencephalous* or brainless monster. Vegetative existence is not impossible, and a brainless monster has been known to survive sixty-five days. The child is usually a very large one.

Closely allied, as we have seen, to the *anencephalous* condition is the condition of congenital *hydrocephalus*. A *hydrocephalic* foetus may survive its birth, and will be more apt to be affected in its nutrition than in its intelligence. In many cases the *hydrocephalic* condition does not come on till after the child is born. The *microcephalous* condition, where it is not a part of cretinism, is not usually a congenital defect in the strict sense, but more often a consequence of the premature union of the bones of the skull along their sutures or lines of growth.

Hermaphroditism.—Although this anomalous condition does not fall under defective closure in the middle line, it may be said to be due to a similar failure of purpose, or to an uncertainty in the *nisus formativus* at a corresponding stage of development. There is a point of time, falling about the eighth week, up to which the embryo may develop either the reproductive organs of the male or the reproductive organs of the female; in the vast majority of cases the future development and growth are carried out on one line or the other, but in a small number there is an ambiguous development leading to various degrees of hermaphroditism or doubtful sex. The primary indecision, so to speak, affects only the ovary or testis respectively, or rather the common germinal ridge out of which either may develop; the uncertainty in this embryonic sexual ridge sometimes leads actually to the formation of a pair of ovaries and a pair of small testes, or to an ovary on one side and a testis on the other; but even when there is no such double sex in the essential organs (as in the majority of hermaphrodites) there is a great deal of doubling and ambiguity entailed in the secondary or external organs and parts of generation. Those parts which are rudimentary or obsolete in the male but highly developed in the female, and those parts which are rudimentary in the female but highly developed in the male tend in the hermaphrodite to be developed equally, and all of them badly. In some cases the external organs of one sex go with the internal organs of the opposite sex. It has been observed that when middle life is reached or passed the predominance in features, voice, and disposition leans distinctly toward the masculine side.

Another curious result of defective separation of symmetrical parts is the siren form of foetus, in which the lower limbs occur as a single tapering prolongation of the trunk like the hinder part of a dolphin, at the end of which a foot (or both feet) may or may not be visible. The defects in the bones underlying this siren form are very various: in some cases there is only one limb (thigh and leg-bones) in the middle line; in others all the bones of each limb are present in more or less rudimentary condition, but adhering at prominent points of the adjacent surfaces. The pelvis and pelvic viscera share in the abnormality. A much more common and harmless case of unseparated symmetrical parts is where the hand or foot has two, three, or more digits fused together. This syndactylous anomaly runs in families.

Allied to these fused or unseparated states of the extremities, or parts of them, are the class of deformities in which whole limbs are absent or represented only

by stumps. The trunk (and head) may be well formed, and the individual healthy; all four extremities may be reduced to short stumps either wanting hands and feet entirely, or with the latter fairly well developed; or the legs only may be rudimentary or wanting, or the arms only, or one extremity only. Although some of these cases doubtless depend upon aberrant or deficient formative power in the particular directions, there are others of them referable to the effects of mechanical pressure, and even to direct amputation of parts within the uterus.

Twins are the physiological analogy of double monsters, and some of the latter have come very near to being two separate individuals. Triple monsters are too rare to dwell upon, but their analogy would be triplets. The Siamese twins, who died in 1874 at the age of sixty, were joined only by a thick fleshy ligament from the lower end of the breast-bone (xiphoid cartilage), having the common navel on its lower border; the anatomical examination showed, however, that a process of peritoneum extended through the ligament from one abdominal cavity to the other, and that the blood-vessels of the two livers were in free communication across the same bridge. There are one or two cases on record in which such a ligament has been cut at birth, one, at least, of the twins surviving. From the most intelligible form of double monstrosity, like the Siamese twins, there are all grades of fantastic fusion of two individuals into one down to the truly marvelous condition of a small body or fragment parasitic upon a well-grown infant—the condition known as *fœtus in fœtu*. These monstrosities are deviations, not from the usual kind of twin gestation, but from a certain rarer physiological type of dual development. In by far the majority of cases twins have separate uterine appendages, and have probably been developed from distinct ova; but in a small proportion of (recorded) cases there is evidence, in the placental and inclosing structures, that the twins had been developed from two rudiments arising side by side on a single blastoderm. It is to the latter physiological category that double monsters almost certainly belong; and there is some direct embryological evidence for this opinion. The Siamese twins are an instance of union at the umbilical region, with the viscera distinct in every respect except a slight vascular anastomosis and a common process of peritoneum; but it is more usual for union in that region to be more extensive, and to entail a single set of abdominal and thoracic viscera. The pelvis is one of the commonest regions for double monsters to be joined at, and, as in the head and abdomen, the junction may be slight or total. The Hungarian sisters Helen and Judith (1701-1723) were joined at the sacrum, but had the pelvic cavity and pelvic organs separate; the same condition obtained in the South Carolina negroes Millie and Christine, known as the "two-headed nightingale," and in the other recent case of the Bohemian sisters Rosalie and Josepha. More usually the union in the pelvic region is complete, and produces the most fantastic shapes of two trunks (each with head and arms) joining below at various angles, and with three or four lower limbs extending from the region of fusion, sometimes in a lateral direction, sometimes downward. A very curious kind of double monster is produced by two otherwise distinct fetuses joining at the crown of the head and keeping the axis of their bodies in a line. It is only in rare instances that double monsters survive their birth, and the preserved specimens of them are mostly of foetal size.

MONSTRELET, ENGUERRAND DE (who, rather owing to accident than to merit, held, until within the present century, the same position as chronicler of French affairs during the early part of the fifteenth

century as Froissart holds with regard to the last half of the fourteenth), was born at an uncertain date, apparently not later than 1400, and died in July, 1453.

MONTAGU, LADY MARY WORTLEY, one of the most brilliant letter-writers of the eighteenth century, was born at Thoresby in Nottinghamshire in 1690, and was the daughter of the Duke of Kingston. Her mother died when she was a child, and by some chance she received or gave herself an unusually wide literary education, had the run of her father's library, was encouraged in her studies by Bishop Burnet, and while still a girl translated the *Enchiridion* of Epictetus. After a courtship in which she showed a singular power of thinking for herself, she was married, in 1712, against her father's wish, to Mr. E. Wortley Montagu, an accomplished and scholarly friend of the Queen Anne wits. At the new court of George I. her beauty and wit brought her much homage; Pope was among her most devoted worshippers, and she even gained and kept the friendship of the great duchess of Marlborough. Her husband being appointed ambassador to the Porte in 1716, she accompanied him to Constantinople, and wrote to her friends at home brilliant descriptions of Eastern life and scenery. These letters were not published till 1763. In one of them she described the practice of inoculation for the smallpox, and announced her intention of trying it on her own son, and of introducing it in spite of the doctors into England. The most memorable incident in her life after her return from the East was her quarrel with Pope, caused, according to her account, by her laughing at him when he made love to her in earnest. He satirized her under the name of Sappho, and she teased him with superior ingenuity and hardly inferior wit. From 1739 to 1761 Lady Mary lived abroad, apart from her husband, maintaining an affectionate correspondence with her daughter, Lady Bute. She died August 21, 1762.

MONTAIGNE, MICHEL DE, essayist, was born February 28, 1533. At six years old, Montaigne was sent to the Collège de Guienne at Bordeaux, then at the height of its reputation, having more than double the number of scholars (two thousand) that even the largest English public school has usually boasted. Among its masters were Buchanan, afterward the teacher of James I., and Muretus, one of the first scholars of the age. These, with their colleague Guérente, composed Latin plays for their pupils to act, and are held to have given no small impulse to the production of the classical French tragedy. Montaigne remained at school seven years, and, like almost all Frenchmen of all times, retained no pleasant or complimentary memory of it. At thirteen he left the Collège de Guienne and began to study law, it is not known where, but probably at Toulouse, the most famous university, despite its religious intolerance, of the south of France. Of his youth, early manhood, and middle life extremely little is known. Allusions to it in the *Essays* are frequent enough, but they are rarely precise. In 1548 he was at Bordeaux during one of the frequent riots caused by the gabelle, or salt tax. Six years afterward, having attained his majority, he was made a counselor in the Bordeaux parliament. In 1558 he was present at the siege of Thionville.

Between the publication of his first two books of essays in 1580, and the publication of the third in 1588, Montaigne's life as distinguished from his writings becomes somewhat better known, and somewhat more interesting. He had, during the eight years of composition of his first volume, visited Paris occasionally and traveled for health or pleasure to Caunterets, Eaux Chaudes, and elsewhere. Charles IX., apparently, had made him one of his gentlemen in ordinary, and perhaps conferred on him the order of St. Michael.

In 1588, after a visit of some length to Paris, the third book of the *Essays* was published, together with the former ones considerably revised. The new essays differ strikingly from the older ones in respect of length; there being only one which confines itself to the average of those in the first two books. The whimsical unexpectedness of the titles, moreover, reappears in but two of them: *Des coches* and *Des boileux*. They are, however, identical with the earlier ones in spirit, and make with them an harmonious whole—a book which has hardly been second in influence to any of the modern world.

Montaigne is one of the few great writers who have not only perfected but have also invented a literary form. The essay as he gave it had no forerunner in modern literature, and no direct ancestor in the literature of classical times.

Montaigne did not very long survive the completion of his book. His sojourn at Paris for the purpose of getting it printed was by no means uneventful, and on his way he staid for some time at Blois, where he met De Thou. In Paris itself he had a more disagreeable experience, being for a short time committed to the Bastille by the Leaguers, as a kind of hostage, it is said, for a member of their party who had been arrested at Rouen by Henry of Navarre. But he was in no real danger. He was well known to and favored by both Catherine de' Medici and the Guises, and was very soon released. In Paris, too, at this time he made a whimsical but pleasant friendship. Marie le Jars, Demoiselle de Gournay, one of the most learned ladies of the sixteenth and seventeenth centuries, had conceived such a veneration for the author of the *Essays* that, though a very young girl and connected with many noble families, she traveled to the capital on purpose to make his acquaintance. He gave her the title of his "fille d'alliance" (adopted daughter), which she bore proudly for the rest of her long life. She lived far into the seventeenth century, and became a character and something of a laughing-stock to the new generation; but her services to Montaigne's literary memory were great. Of his other friends in these last years of his life the most important were Étienne Pasquier and Pierre Charron. Montaigne died September 11, 1592.

MONTALEMBERT, CHARLES FORBES DE, historian, was born May 29, 1810. Montalembert's father, René, emigrated, fought under Condé, and subsequently served in the English army. He married a Miss Forbes, and his eldest son Charles was born at London. At the Restoration René de Montalembert returned to France, was raised to the peerage in 1819, and became ambassador to Sweden (where Charles received much of his education) in 1826. He died a year after the overthrow of the legitimate monarchy. Charles de Montalembert was too young to take his seat as a peer (twenty-five being the necessary age), but he retained other rights; and this, combined with his literary and intellectual activity, made him a person of some importance. He was formally charged with unlicensed teaching. He claimed the right of trial by his peers, and made a notable defense, of course with a deliberate intention of protest. His next most remarkable act was his participation in the famous pilgrimage to Rome of his two friends. Montalembert submitted dutifully to the encyclical of June, 1835, and only devoted himself more assiduously to the work on which he was engaged, the *Life of St. Elizabeth of Hungary*. This appeared in 1836. It displayed Montalembert's constant literary characteristics, and, though inferior to *Les Moines d'Occident* in research and labor, is perhaps superior to it as a work of art. Montalembert still

clung to his early liberalism, and he made himself conspicuous during the reign of Louis Philippe by his protests against the restrictions imposed on the liberty of the press, besides struggling for freedom in national education. The party which he represented, or rather which he strove to found, was by no means wholly Legitimist at heart, and at the downfall of Louis Philippe Montalembert had no difficulty in accepting the republic and taking, when elected, a seat in the assembly. He had not a little to do with the support given by France to the pope. As he had accepted the republic, he was not disinclined to accept the empire; but the measures which followed the *coup d'état* disgusted him, though he still sat in the chamber. A defeat in 1857 put an end to his parliamentary appearances. He was still, however, recognized as one of the most formidable of the moderate opponents of the empire, and he was repeatedly prosecuted for anti-imperialist letters and pamphlets. In the ten years between 1840 and 1850 he wrote little but political pamphlets, but after the establishment of the empire, and especially after he lost his seat in the chamber, he became more prominent as an author. Even before this he had produced a volume on the *Avenir Politique de l'Angleterre* (1855), and another on *Pie IX. et Lord Palmerston* (1856), besides numerous articles and pamphlets, the chief of which were perhaps *Une Nation [Poland] en Deuil*, and *L'Église Libre dans l'État Libre*.

His great work, the fruit of many years' labor, did not appear till he was fifty years old, and ten years before his death, which occurred before its completion. Montalembert, who had married Mademoiselle de Merode, sister of one of Pius IX.'s ministers, but who had no male offspring, died in March, 1870.

MONTALVÁN, JUAN PEREZ DE, Spanish dramatist and writer of fiction, was the son of the king's bookseller, and was born at Madrid in 1602. At the early age of seventeen he became a licentiate in theology, and in 1626, after entering the priesthood, he received a notarial appointment in connection with the Inquisition. His overtaken brain succumbed under the numerous literary labors he imposed on it, and he died when only thirty-six years old (June 25, 1638).

MONTANA was admitted to the Union in 1889. The country was originally acquired by the United States under the Louisiana purchase. It became successively a part of Louisiana Territory, of Missouri Territory, of Nebraska Territory, and of Dakota. On May 26, 1864, it was organized under a Territorial government of its own, with practically its present boundaries. The exploration of this region commenced with the celebrated expedition of Lewis and Clarke in 1803-1806. Between 1850 and 1855 it was traversed and mapped by a number of exploring parties, having in view the selection of transcontinental railroad routes. Since then numberless expeditions have examined it, and some systematic topographic work has been done under different branches of the United States Government. The first settlers entered the Territory in 1861, discovered placer gold on Little Prickly Pear Creek, and shortly after built the city of Helena. Later, the placers at Bannack were discovered, and a small "rush" to the Territory commenced. In 1863 the rich placers at Alder Gulch were brought to view, and miners and adventurers swarmed in from all parts. Then it was that the early social history of California was repeated on a smaller scale in Montana. The lawless element assumed control, and for many months neither life nor property was safe. Indeed, for a time the community was in a state of blockade; no one with money in his possession could get out of the Territory. Finally, the citizens organized

a "Vigilance Committee" for self-preservation, took the offensive, and, after a short, sharp struggle, rid the community of its disturbing elements.

The State is bounded on the north by British Columbia, south by Wyoming and Idaho, west by Idaho, and east by the Dakotas. Its approximate area is 146,000 square miles. Topographically, Montana may be separated into two great divisions—that of the plains, comprising the eastern two-thirds, and that of the mountains, comprising the western portion. The former, a monotonous rolling expanse, broken only by the beds of the few streams which traverse it, and by a few small groups of hills, extends over nine degrees of longitude in a gentle uniform slope, rising from 2,000 feet above the sea at the eastern boundary to 4,000 feet at the base of the Rocky Mountains. Except along the streams and upon the scattered groups of hills, this section is entirely devoid of forest-growth of any kind. Vegetation is limited to the bunch grasses, artemisia, and cacti. The grasses are the most abundant and luxuriant near the mountains, where the rainfall is greatest. The mountain section, comprising the western third of the State, is composed, in general terms, of a succession of ranges and valleys running very uniformly somewhat in a northwest and southeast direction. The mountains vary in height from 8,000 to 10,000, even in isolated cases reaching 11,000 feet, with mountain passes 6,000 to 8,000 feet above the sea. In the mountainous part of the State are the headwaters of the Missouri (Atlantic basin) and Clarke's Fork of the Columbia (Pacific basin). The former rises in the southwest of the State in three large branches, the Jefferson, Madison, and Gallatin, which meet at the foot of the Gallatin valley at a point known as the "Three Forks of the Missouri." Here the Missouri is a good-sized stream, fordable with difficulty even when the current is lowest. From this point to its mouth navigation is possible when the stream is not below its mean height; it is interrupted only at the Great Falls of the Missouri, near Fort Benton, above which, however, it is practically little used for navigation. Its other principal tributaries in its upper course are the Sun, Teton, Marias, Musselshell, and Milk rivers, all of which vary much in size with the season—the last two being nearly or quite dry near their mouths in the fall of the year. The Yellowstone, one of the most important tributaries of the Missouri, has nearly all its course in Montana, and is navigable for small steamers as far as the Crow Agency, except when the water is low. Clarke's Fork of the Columbia is formed by the junction of the Flathead and the Missoula or Hellgate river. The former rises in the mountains of British Columbia and flows nearly south through Flathead Lake to its point of junction with the Missoula. The latter rises opposite the Jefferson river and flows northward, receiving on its way several large affluents. Below the point of junction of these streams, Clarke's Fork flows northwest along the base of the Bitter-root Mountains into Idaho. This stream is very rapid, and is not navigable. Its course, as well as those of most of its tributaries, passes through narrow valleys, the surrounding country being well-watered and covered with dense forests of *Conifera*.

The climate of Montana differs almost as greatly in different parts of the State as that of California. In the northwest it resembles that of the Pacific coast. The westerly winds blowing off the Pacific do not meet with as formidable a barrier as farther south, and consequently are not chilled, or deprived of so large a proportion of their moisture. The result is that the northwestern portion of Montana enjoys a mild temperature and a rainfall sufficient for the needs of agriculture.



The valleys of the Kootenai, Flathead, Missoula, and Bitter-root can be cultivated without irrigation with little danger of loss from drought. Farther east and south the rainfall decreases. In the valleys of the upper Missouri, the Jefferson, Madison, Gallatin, and the upper Yellowstone irrigation is almost everywhere required, as well as over the broad extent of the plains. Over most of the State the rainfall ranges from ten to fifteen inches annually; in the northwestern corner it rises to twenty-five.

The general temperature is comparatively mild for the latitude, the elevation above the sea being decidedly less than that of the average of the Rocky Mountain region. The mean annual temperature ranges from 40° to 50° Fahr., but the variations are very great and violent. Frosts and snowstorms are possible during every month of the year, so that agriculture and stock-raising are more or less hazardous. On the other hand, the ordinary extremes of temperature are not so great as in the more arid portions of the country.

Throughout the State, as everywhere else in the Cordilleran region, forests follow rainfall. The plains are treeless; the mountain valleys about the heads of the Missouri are clothed only with grass and artemisia, in many localities extending to a considerable height up the mountains, which are themselves timbered, though not heavily. In the northwestern part, roughly defined as the drainage area of Clarke's Fork, where the rainfall is somewhat greater, the forests become of importance. The mountains are forest-clad from summit to base; and the narrower valleys are also covered, while the timber is of larger size and of much greater commercial value than elsewhere in the State—the valuable timber consisting entirely of the various species of *Conifera*, pine, fir, cedar, etc. Of the broad-leaved species, willow, aspen, and cotton-wood are abundant.

The native fauna is not sharply distinguished from that of neighboring States and Territories. The higher latitude is, however, indicated by the relatively greater abundance of species favoring a colder climate. The moose and the Rocky Mountain goat, though by no means abundant, still frequent chosen haunts in the mountains—the former in the cool marshy valleys, the latter upon the most rugged inaccessible elevations. The black-tailed and mule deer, the antelope, elk, and mountain sheep are abundant, and the bison still ranges the plains, though in sadly reduced numbers. Among *Carnivora*, the black and grizzly bears, mountain lion, lynx, wild cat, and several species of wolves are still plentiful.

Agriculture is dependent in most parts of Montana upon the supply of water furnished by the streams. Owing to this fact it is probable that not more than 8 per cent. of the total area of Montana can ever, even under the most economical distribution of the water-supply, be brought under cultivation. In the drainage area of Clarke's Fork are several fine valleys containing a considerable extent of arable land, such as those of the Missoula, Bitter-root, Deer Lodge, Jocko and Flathead. Upon the head-waters of the Missouri is also a large extent of arable land. The valleys of the Jefferson and Madison also deserve mention. Along the eastern base of the mountains, near the head-waters of the Sun, Teton, and Marias rivers, are considerable areas susceptible of irrigation. Below the Forks the Missouri flows for seventy-five miles through a broad valley, much of which can be irrigated; below Fort Benton, however, the bluffs become higher and close in on the river. The Yellowstone, also, after leaving the mountains, flows through a similar kind of valley, which extends with a few minor breaks down to the point where the river turns from an east to a northeast

course, when it enters a country of *mauvaises terres*, which, except as a mausoleum of fossil remains, is utterly valueless.

Montana is rich in minerals, the principal being gold, silver, copper, and lead. More than 12,000 mining claims have been located under the United States mining laws, but few of the mines have been developed. No reliable statistics of the metal output are obtainable, but the claim is made that Montana leads all other States in the amount of its production of gold and silver. In 1889 twelve of the leading mines paid dividends amounting to \$3,714,250.

Of the 90,000,000 acres in the State about two-fifths are supposed to be cultivable, and about 12,000,000 acres consist of farms. Grain is grown chiefly in Gallatin and Bitter Root valleys, but the great need of Montana is irrigation, and without this the growth of the cereals is scarcely possible. The State is rich in timber, and has large deposits of bituminous coal, not yet developed. The United States census returns for 1890 showed a population of 132,159, but at the twelfth census of 1900 there were 243,329. In 1888 the vote for delegate to Congress was 40,014, which at the estimate of one vote to four inhabitants, would show 160,000 people.

The assessment of Montana in 1900 was \$167,430,533 and there is no public debt. The tax levy under the Territorial administration was only two mills on the dollar. In 1900, 1,736,701 acres of public lands were improved. On January 1, 1900, the mileage of completed railroads was 2,932, and there were 283 miles in course of construction. An official estimate of the products in 1890, gives the following figures:

Gold (\$4,819,156) and silver.....	\$26,605,990
Copper, ore produced, 50,437 tons; value smelted and refined.....	\$36,387,063
Lead.....	\$ 1,000,000
Cows, cattle and horses.....	\$ 1,298,359
Sheep, number of.....	4,215,214
Wool.....	\$ 5,136,658

The manufactures of Montana, in 1900, embraced 1,080 establishments, with an aggregate capital of \$40,945,846; the value of their combined products was \$57,075,824. The capital and chief city of Montana is Helena (*q.v.*), pop. (1900), 10,770; that of Butte, 30,470.

MONTANISM is a somewhat misleading name for the movement in the second century which, along with Gnosticism, occupied the most critical period in the history of the early church. It was the overthrow of Gnosticism and Montanism that made the "Catholic" church.

MONTARGIS, chief town of an arrondissement in the department of Loiret, France, lies forty miles east-northeast of Orleans on the railway from Paris to Lyons. Population (1901), 10,000.

MONTAUBAN, chief town of the department of Tarn-et-Garonne, France, is situated on a slight eminence between the right bank of the Tarn and its tributary streams, the Tescou and Lagarrigue, 128 miles by rail east-southeast of Bordeaux. The population (1901) was 30,603.

MONTBELIARD, chief town of an arrondissement in the department of Doubs, France, is situated at the confluence of the Allaine and the Lusine, tributaries of the Doubs, and on the canal between the Rhine and the Rhone, about forty miles northeast of Besançon. Once a fortified city, it still retains the old castle of the counts of Montbéliard. A bronze statue of Cuvier, the most illustrious native of Montbéliard, and several fine fountains adorn the town, which also possesses a museum of natural history and antiquities, and a Protestant normal school. Population (1901), 10,000.

MONTCLAIR, a town of Essex county, N. J., with a population in 1900 of 13,962.

MONTE CARLO. See **MONACO**.

MONTE CASINO (or **CASSINO**). The Benedictine monastery, known as the abbey of Monte Cassino, is a huge square building of three stories, built on the usual Benedictine plan (see **ABBEY**) on the summit of a picturesque isolated hill, about three and a-half miles to the northeast of the town of Cassino (Casinum) or San Germano (population about 5,000), which lies midway between Rome and Naples in the valley of the Garigliano. The most prominent architectural feature is the large church (1727), richly decorated in the interior with marbles, mosaics, and paintings.

MONTECUCULI, **RAIMONDO**, COUNT OF, a prince of the empire and duke of Melfi, a famous Austrian general, was born at the castle of Montecuculi in Modena, in 1608. At the age of nineteen he began his career in a regiment of infantry under his uncle, Ernest, count of Montecuculi; and during the Thirty Years' War he found many opportunities of displaying his military genius in the imperial service. Montecuculi's last achievement in war was the siege of Philippsburg. During the rest of his life he was president of the council of war. In 1679 the emperor Leopold made him a prince of the empire, and shortly afterward he received from the king of Naples the dukedom of Melfi. Having accompanied the emperor to Linz during the pestilence, he was injured by the fall of a beam when entering the castle, and died at Linz on October 16, 1680.

MONT-DORE-LES-BAINS, a village of France in the department of Puy de Dôme, seventeen miles as the crow flies southwest of Clermont Ferrand, 3,432 feet above the sea, on the right bank of the Dordogne not far from its source. The Monts Dore, from which it takes its name, close the valley toward the south; their culminating peak, Puy de Sancy (6,188 feet), is the highest eminence of central France. The mineral springs of Mont Dore were known to the Romans.

MONTELEONE (usually called Monteleone of Calabria to distinguish it from Monteleone of Apulia in the province of Avellino, which gave its name to the mediæval duchy of the Pignatelli family) is a city of Italy in the province of Catanzaro, on the western side of the Bruttian peninsula, and is beautifully situated on an eminence gently sloping toward the gulf of Sta. Eufemia. It was almost totally destroyed by earthquake in 1783, and for many years afterward consisted mainly of slight wooden erections, but under the French occupation it was made the capital of a province and the headquarters of General Regnier, and it is now a well-built town with a population of 10,000.

MONTÉLIMAR, chief town of an *arrondissement* and canton in the department of Drôme, France, is situated near the left bank of the Rhone, ninety-three miles south of Lyons on the railway to Marseilles. Population, 12,894.

MONTENEGRO, often pronounced and sometimes written **MONTENERO**, one of the smallest of European countries, lies on the eastern side of the Adriatic, and is bounded by Dalmatia, Herzegovina, Bosnia, and Albania. Previous to 1878 it had an area estimated at 1,669 square miles. The enlargement to about 5,272 square miles proposed by the San Stefano treaty (1878), would probably have swamped the Montenegrin nationality, and the Berlin Congress brought the total area only up to 3,630 miles. Apart from her new maritime district, Montenegro seems little better at first than a chaos of mountains, but on closer examination it appears that there are two distinct groups, an eastern and a western, divided by the Zeta-Moratcha valley. The great mass of the people belong to the Orthodox

Greek Church, only some 7,000 being Roman Catholics and 3,000 Mahomedans. According to Kaptsevitch, the population was 10,700 in 1838, 120,000 in 1849, 124,000 in 1852, and 170,000 in 1877, but in 1879 it was found that, inclusive of the new territory, the number could not exceed 150,000; since then about 15,000 have been added with Dulcigno. The official returns for 1902 (not based on a census, however), give 228,000 as the total, of whom some 23,000 live in the so-called towns.

Cettinje, with about 4,000 inhabitants, is the capital of the country. Podgoritz (about 6,000 or 7,000 in 1879, since reduced to 4,000) is the principal trading town; it lies at the foot of the mountains, at the junction of the Ruibnitz with the Moratcha, and in Turkish hands was one of the strongest of their fortresses toward Montenegro.

Montenegro is an absolute hereditary monarchy, vested according to the principle of primogeniture in the family of Petrovitch Nyegush. The prince bears the title "Prince of Montenegro and the Berda (mountains)"—Montenegro here meaning the old Montenegrin nahias (provinces) of Katunska, Trzmitza, Ryetchka, and Lyeshanska, and Berda the territory added in the eighteenth century of the provinces Byelopavlitshka, Piperska, Moratchska, Vasoyevitchska, and Kutska. A responsible ministry was introduced in 1877, and there are now separate departments of justice, foreign affairs, war, and finance and education. The highest administrative body is the council of state, instituted in 1879, and consisting of eight members appointed by the prince. Justice in ordinary cases is rendered in primitive fashion.

MONTEREY, the capital of California up to 1847, is situated on Monterey Bay, 125 miles south from San Francisco by the southern division of the Southern Pacific railroad. Originally founded in 1770 as a mission station and presidio (garrison) by Junipero Serra, it is still in the main a Spanish-looking town, with Spanish talked in its streets and painted on its signboards. At the meeting of the first constitutional convention of California Monterey was a port of entry with a flourishing trade and a promising future; but it soon suffered from the rivalry of San Francisco, and it is now a sleepy place, straggling and dirty, with many of its adobe buildings abandoned to decay. Pop., 1,748.

MONTEREY, a city of Mexico, capital of the state of Nueva Leon, lies on a sub-tributary of the Rio Grande del Norte, 150 miles south-southwest of Nuevo Laredo, and 190 west-southwest of Matamoras. A handsome and well-planned city, with a cathedral and a number of good public buildings, Monterey is also in commercial and manufacturing activity the most important place in the northern parts of the republic, and one of the principal stations on the railway opened in 1882 between the city of Mexico and the United States frontier (at Matamoras and Nuevo Laredo). The population was about 46,000 in 1900. The city was founded in 1596, became a bishopric in 1777, and was captured by the United States forces under General Taylor in September, 1846.

MONTE SAN GIULIANO, a city of Sicily, in the province of Trapani and twelve miles northeast of the town of Trapani, occupies the summit of the mountain from which it takes its name. In the modern town, the population of which has recently decreased to about 3,000 by the migration of considerable numbers to the plain, the chief points of interest are the cathedral, internally restored in 1865, the castle, which occupies the site of the temple, and the three so-called *torri del Bálío*, which probably represent the propylæa.

MONTE SANT' ANGELO, a city of Italy in the province of Foggia (Capitanata), ten miles north of

Manfredonia, stands on an offshoot of Monte Gargano 2,824 feet high. Population (1901), about 17,000.

MONTESQUIEU, CHARLES LOUIS DE SECONDAT, BARON, philosophical historian; was born at the chateau of La Brède about ten miles to the southeast of Bordeaux, in January, 1689. Montesquieu was in his youth known as M. de la Brède. His mother died when he was seven years old, and when he was eleven he was sent to the Oratorian school of Juilly, near Meaux, where he stayed five years, and where, as well as afterward at Bordeaux, he was thoroughly educated. The family had long been connected with the law, and Montesquieu was destined for that profession. His father died in 1713, and a year later Montesquieu, or, as he should at this time strictly be called, La Brède, was admitted counselor of the parliament. In little more than another twelvemonth he married Jeanne Lartigue, an heiress and the daughter of a knight of the order of St. Louis, but plain, somewhat ill-educated, and a Protestant. In 1716 his uncle died, leaving him his name, his important judicial office, and his whole fortune. He thus became one of the richest and most influential men in the district. He continued to hold his presidency for twelve years. In the *Lettres Persanes* (1721) Montesquieu not only satirized unmercifully the social, political, ecclesiastical and literary follies of his day in France, but indulged in a great deal of the free writing (so free as very nearly to deserve the term licentious) which was characteristic of the tale-tellers of the time. But what scandalized grave and precise readers naturally attracted the majority, and the *Lettres Persanes* were very popular, passing, it is said, through four editions within the year, besides piracies. It is amusing to find Voltaire describing the *Lettres* as a "trumpery book," a "book which anybody might have written easily." It is not certain that, in its peculiar mixture of light badinage with not merely serious purpose but gentlemanlike moderation, Voltaire could have written it himself, and it is certain that no one else at that time could. The reputation acquired by this book brought Montesquieu much into the literary society of the capital, and he composed for, or at any rate contributed to, one of the coteries of the day the clever but rather rhetorical *Dialogue de Sylla et d'Eurcrate*, in which the dictator gives an apology for his conduct.

In 1725 Montesquieu was elected a member of the Academy, but an almost obsolete rule requiring residence in Paris was appealed to, and the election was annulled. In 1726 he sold the life tenure of his office, reserving the reversion for his son, and went to live in the capital, returning, however, for half of each year to La Brède. There was now no further formal obstacle to his reception in the Académie Française, and he was elected and received in January, 1728. Almost immediately afterward he started on a tour through Europe, to observe men, things, and constitutions. He traveled through Austria to Hungary, but was unable to visit Turkey, as he had proposed. Then he made for Italy, where he met Chesterfield. At Venice, and elsewhere in Italy, he remained nearly a year, and then journeyed by way of Piedmont and the Rhine to England. Here he stayed for some eighteen months, and acquired an admiration for English character and polity which never afterward deserted him. He had always been interested in ancient Rome and her history, and he had composed not a few minor tracts on the subject, of which many titles and some examples remain, besides the already mentioned dialogue on Sylla. All these now took form in the *Considérations sur les Causes de la Grandeur et la Décadence des Romains*, which appeared in 1734 at Amsterdam without the

author's name. This, however, was perfectly well known; indeed, Montesquieu formally presented a copy to the French Academy.

But all the time he must have been steadily working at his great book, indeed, a contemporary accuses him of having only gone into society to pick up materials for it. But it seems that he did not begin the final task of composition till 1743. Two years of uninterrupted work at La Brède finished the greater part of it, and two more the rest. It was finally published at Geneva in the autumn of 1748, in two volumes quarto. The publication was, however, preceded by one of those odd incidents which in literature illustrate Clive's well-known saying about courts-martial in war. Montesquieu summoned a committee of friends, according to a very common practice, to hear and give an opinion on his work. It was an imposing and certainly not an unfriendly one, consisting of Hénault, Helvétius, the financier Silhouette, the dramatist Saurin, Crébillon the younger, and lastly, Fontenelle—in fact, all sorts and conditions of literary men. The members of this eminently competent tribunal unanimously, though for different reasons and in different forms of expression, advised the author not to publish a book which has been recently described by a judge of certainly not less competence as "one of the most important books ever written," and which, when importance of matter and excellence of manner are jointly considered, may be almost certainly ranked as the greatest book of the French 18th century.

Montesquieu, of course, did not take his friends' advice. In such cases no man ever does, and in this case it was certainly fortunate. The *Esprit des Lois* represents the reflections of a singularly clear, original, and comprehensive mind, corrected by forty years' study of men and books, arranged in accordance with a long deliberated plan, and couched in language of remarkable freshness and idiosyncrasy. The curious little romance of *Arsace et Isménie*, a short and unfinished treatise on Taste, many of his published *Pensées*, and much unpublished matter date from the period subsequent to the *Esprit des Lois*. He did not, however, live many years after the appearance of his great work. At the end of 1754 he visited Paris. He was shortly after taken ill with an attack of fever, which affected the lungs, and he died on February 10, 1755, aged sixty-six. He was buried in the church of Saint Sulpice with little pomp, and the Revolution obliterated all trace of his remains.

MONTEVERDE, CLAUDIO, the inventor of the "free style" of musical composition, was born at Cremona in 1568, and died in 1643.

MONTEVIDEO, SAN FELIPE Y SANTIAGO DE, the capital of the republic of Uruguay (Banda Oriental) in South America, lies on the eastern side of a nearly semicircular bay on the northern shore of the estuary of the La Plata, 120 miles from Buenos Ayres, with which communication is maintained by a daily service of steamers. The small peninsula on which the city is built does not rise more than ninety-five feet above the level of the sea; but the headland of Cerro, 505 feet high, which forms the western side of the bay, is notable enough on that low-lying coast to justify the name Montevideo; it is crowned by a lighthouse, and by an old Spanish fort, once of considerable strength. About 620 acres is the area occupied by the city proper; the suburbs stretch for miles into the country. As a whole, the city is overbuilt, and immense wealth has been squandered in Italian marbles, and other forms of architectural decoration. The streets are for the most part well paved, and there is an extensive tramway system. Previous to 1870, when water was introduced from a distance of forty miles, the whole supply was dependent on the rainfall. In the old town the principal square is

the Plaza de la Constitucion, the south side of which contains the "cathedral," and the north side the *cabildo* (law-courts, senate-house, and prison). The cathedral is a somewhat imposing building, consecrated October 21, 1804, with a dome and two side towers 133 feet high, which form one of the best landmarks of the bay. In the line of the old ramparts formerly stood the old Spanish citadel, which was built by the seven years' forced labor of 2,000 Guarani Indians. From 1835 to 1868 it served as the principal market in the city; in 1877 it was removed and the area united with the fine Plaza de la Independencia at the southwestern end of Calle del 18 Julio, a broad street which runs in a straight line right through the new town. The new market, covering two acres, was built in 1867, and there are besides the Port market and the Mercado Chico. The Exchange, constructed after the style of the Bourse at Bordeaux, dates from 1864.

Since the beginning of the century the depth of water in the bay has been allowed to diminish five feet, and the area has been reduced by the construction (1868) of an embankment to carry the railway across it. Dredging has been tried from time to time, but on too limited a scale. The so-called harbor is a space of less than half a mile square off the northwest face of the town; in 1870 it was reported to be yearly becoming smaller and less safe, and vessels are now obliged to anchor further out. Among modern improvements in the port the most noteworthy are the Maua dry docks, opened in 1873, and the larger docks, erected in 1877 at a cost of \$2,000,000, at the foot of the Cerro on the other side of the bay. The trade of Montevideo consists mainly in the export of raw products of the slaughter-house (horns, hides, hair, tallow, wool, bones), with a certain quantity of live stock and preserved meat, and in the import of European manufactures. The population is largely of foreign origin, Italian, Spanish, Basque, and French. In 1874 the Italians, who had rapidly increased after the siege, were about 40,000 strong, and in several quarters of the city nothing was to be heard save North-Italian dialects. Even in 1880, after the exodus caused by the confiscations of 1875, they numbered 36,300. The greater proportion are engaged as petty traders. In 1879 the total population of the town was 73,879; it had been 92,260 in 1878, and 105,296 in 1871, and now, including environs, is (1900) 220,000.

MONTEZUMA. See CORTES and MEXICO.

MONTEFAUCON, BERNARD DE, critic and scholar, was born at the chateau of Soulage (now Soulatgé, in the department of Aube, France), on January 13, 1655. In 1672 he entered the army, and in the two following years served as a volunteer in Germany under Turenne. But ill-health and the death of his parents brought him back to his studious life, and in 1675 he entered the cloister of the Congregation of St. Maur, at La Daurade, Toulouse, taking the vows there on May 13, 1676. Apart from his vast literary labors, the remainder of his life presents little to record. He died on December 21, 1741.

MONTFORT, SIMON DE, EARL OF LEICESTER, a great political leader, and sometimes referred to as the "founder of the English House of Commons," born in France about the beginning of the thirteenth century, was the fourth and youngest son of Simon IV. de Montfort and of Alice de Montmorency. Of his early life and education nothing is known, the first definitely recorded fact about him being that in April, 1230, he was in England and had attached himself to the service of Henry III., who granted him a temporary pension of 400 marks, with the promise of the earldom which his father had held. Handsome, talented, and brave, he gained the love of Eleanor, widow of the earl of Pem-

broke, and sister of the king, to whom he was privately married at Westminster on January 7, 1238, Henry himself giving away the bride. When the fact became known, the indignation of the baronage and of the people had almost broken out in open rebellion, and, after Simon had with difficulty averted this by propitiating his brother-in-law, Richard, earl of Cornwall, he found it necessary to go to Rome to meet the objections which the church had raised on the ground of an alleged previous vow made by Eleanor. There is some ground for believing that he went to the Holy Land in 1240, and a letter is still extant in which the nobility of the kingdom of Jerusalem ask Frederick II. (June, 1241) to allow Simon de Montfort, earl of Leicester, to act as regent till the arrival of his son Conrad. In 1242 he accompanied Henry's unsuccessful expedition to France. Toward the end of 1252 De Montfort retired into France, where such was the reputation he enjoyed as a statesman that, on the death of the queen-regent and in the absence of Louis IX., he was offered the office of high steward and a place among the guardians of the crown. This, however, he declined, "being unwilling to prove a renegade;" and, after a partial reconciliation with Henry, he returned to England in 1254. In the following year he was sent on a secret mission into Scotland, and in 1257 he was one of the king's ambassadors to France; but his chief activity between 1254 and 1258, if we are to judge by the prominent place he took in the revolution of the last-named year, must have been in the meetings of parliament.

In the early part of 1259 he was chiefly busied with the task of adjusting the terms of a peace with France, which was not settled until the end of that year. From the date of the conclusion of that peace, owing to divisions in the reforming party, the king began to regain his lost power, and in 1262 he felt himself strong enough to repudiate the Provisions of Oxford, thus giving the signal for civil war. The successes of the barons, led by De Montfort, in the west, and his victorious entry into London again reduced the king to submission, but only to bring once more also into prominence the divided state of Leicester's supporters. Louis' one-sided Mise of Amiens (1264), however, rendered another appeal to arms on the part of the barons inevitable, and by the victory of Lewes (May 14, 1264) De Montfort for the time became master of England. Taking Henry, his prisoner, along with him to London, he summoned thither the parliament, which met in June, and drew up the constitution or scheme of government associated with his name, of which the most striking feature is the new development it gives to the representative system. A still further advance in the development took place in 1265, when borough members, as distinguished from county members, were for the first time summoned. Meanwhile troubles in the west required De Montfort's presence in the field, and, by the alliance of his rival Gloucester with Roger Mortimer, as well as by the escape of Prince Edward, who put himself at the head of the royalist opposition, the great parliamentary leader was placed in serious straits. At Evesham, where he had halted on his march to join his son at Kenilworth, he was surprised by the army of Prince Edward, and after a struggle of about two hours was slain on the field of battle (August 4, 1265).

MONTGOMERY, an inland county of Wales. Its greatest length from southeast to northwest is about forty miles, and its breadth from east to west, about thirty-five miles. The area is 495,089 acres, or about 797 square miles. Pop. (1901), 54,892.

MONTGOMERY, the county town, is situated on the declivity of a well-wooded hill near the eastern bank of the Severn. Population, 1,200.

MONTGOMERY, a district in the lieutenant-governorship of the Punjab, with an area of 5,573 square miles.

MONTGOMERY, the county seat of Montgomery county and capital of the State of Alabama, stands on the left bank of the Alabama river, on a pleasant, hilly site, 175 feet above sea-level. It is 158 miles northeast of Mobile, and has steamboat connections with that city and the Gulf of Mexico. Six railway lines pass through or have their termini in Montgomery, thus making it the receiving and distributing center for a large section of productive country. The city was founded in 1817, and was named after Gen. Richard Montgomery, who was killed at Quebec in 1775. In 1847 the State capital was transferred from Tuscaloosa to Montgomery, where a State capitol, one of the handsomest in the South, was erected for the accommodation of the executive and legislature. Other important buildings are the Federal offices and postoffice, the Masonic temple, two fine theaters, and thirteen hotels. There are two national and five other banks. The city has a first-class fire department, maintained at an expense (1889) of \$10,192. The police department consists of twenty-six officers and men, and cost \$24,037 in 1889. The city has grown very rapidly since the war, and now has a population (1900) of 30,346. Its bonded debt is \$722,050; annual receipts for 1889 were \$336,424, expenditures during same period, \$267,789. There is a good public-school system, with an appropriation last year of \$20,410, and expenditures of \$17,417. There are five schools, three for whites and two for blacks, with an enrollment of 992 white and 543 colored pupils. Pickett Springs Park, four miles from the court-house, is the principal park, and there is a handsome city cemetery.

Montgomery is notable in history as the city in which on February 4, 1861, delegates of the seceding States met to organize the Confederacy. Howell Cobb presided, and on the 9th the convention organized a Provisional Government under the title of "the Confederate States of America." Jefferson Davis, of Mississippi, and Alexander H. Stephens, of Georgia, were respectively elected Provisional President and Vice-President of the newly-constituted government. Montgomery became the capital of the Confederacy, and so remained until the seat of government was transferred to Richmond, Va.

MONTGOMERY, ALEXANDER, whose life fell between 1550 and 1610, was the last of the series of Scottish poets who flourished in the sixteenth century under the patronage of the Jameses.

MONTGOMERY, JAMES, poet and journalist, was justly described by Lord Byron, in a footnote to *English Bards and Scotch Reviewers*, as "a man of considerable genius," though it was going far beyond the mark to speak of his *Wanderer of Switzerland* (his first notable poem, published in 1806) as being worth a thousand "Lyrical Ballads." Montgomery was born November 4, 1771, at Irvine in Ayrshire, Scotland. Part of his boyhood was spent in Ireland, but he received his education in Yorkshire, at the Moravian school of Fulneck, named after the original home of the Moravians, to which sect his father belonged. He drifted at an early age into journalism, and edited the *Sheffield Iris* for more than thirty years. When he began his career the position of a Dissenting journalist was a difficult one, and he twice suffered imprisonment (in 1795 and 1796) on charges that now seem absurdly forced and unfair. His *Wanderer* was mercilessly ridiculed by the *Edinburgh Review*, but in spite of this Montgomery published many widely popular poems. He died in 1854.

MONTGOMERY, ROBERT, author of *The Omnipresence of the Deity* (1828), *Satan* (1830), and *The*

Messiah (1832) was the Montgomery ridiculed and denounced in Macaulay's famous essay. As a poet he deserved the censure. He was born 1807; died, 1855.

MONTH. See **ASTRONOMY** and **CALENDAR**.

MONTILLA, a small and unimportant town of Spain in the province of Cordova, thirty-two miles to the south of the city of Cordova. Population about 15,000.

MONTLUC, BLAISE DE LASSERAN-MASSENCOME, SEIGNEUR DE, marshal of France, was born about 1503. His chief feat was the famous defense of Siena (1555), which he has told so admirably. When the religious wars broke out in France, Montluc, a staunch royalist, held Guienne for the king, and exercised severe but impartial justice on Catholics and Protestants alike. He would have nothing to do with the Massacre of St. Bartholomew. Henry III., however, made him marshal of France, an honor which he had earned by nearly half a century of service and by numerous wounds. He died at Estillac near Agen in 1577.

MONTLUÇON, the industrial capital of the center of France, sometimes called the French Manchester, is the head of an arrondissement, and the largest town (26,079 inhabitants) of the department of Allier.

MONTMORENCY, the name of one of the oldest and most distinguished families in France, is derived from Montmorency, now in the department of Seine-et-Oise, in the immediate neighborhood of Enghien and St. Denis, and about nine miles to the north-northwest of Paris. The family, since its first appearance in history in the person of BOUCHARD or BURCHARD I., sire de Montmorency in the tenth century, has furnished six constables and twelve marshals of France, several admirals and cardinals, numerous grand officers of the crown and grand masters of various knightly orders, and was declared by Henry IV. to be, after that of the Bourbons, the first house in Europe. ANNE de Montmorency, so named, it is said, after his god-mother Anne of Brittany, was the first to attain the ducal title. He was born at Chantilly in 1493, and was brought up with the dauphin, afterward Francis I., whom he followed into Italy in 1515, distinguishing himself especially at Marignano. In 1516 he became governor of Novara; in 1520 he was present at the Field of Cloth of Gold, and afterward had charge of important negotiations in England. He was made marshal of France in 1522, accompanied Francis into Italy in 1524, and was taken prisoner at Pavia in 1525. In 1538, on the ratification of the ten years' truce, he was rewarded with the office of constable, but in 1541 he fell into disgrace, and did not return to public life until the accession of Henry II. in 1547. In 1548 he repressed the insurrections in the southwest, particularly at Bordeaux, with great severity, and in 1549-1550 conducted the war in the Boulonnais, negotiating the treaty for the surrender of Boulogne on March 24, 1550. In 1551 his barony was erected into a duchy. Soon afterward his armies found employment in the northeast in connection with the seizure of Metz, Toul, and Verdun by the French king. His attempt to relieve St. Quentin issued in his defeat and captivity (August 10, 1557), and he did not regain his liberty until the peace of Cateau-Cambrésis in 1559. On the accession of Charles IX. in 1560 he resumed his offices and dignities, and, uniting with his former enemies, the Guises, played an important part in the Huguenot war of 1562. Though the arms of his party were victorious at Dreux, he himself fell into the hands of the enemy, and was not liberated until the treaty of Amboise (March 19, 1563). In 1567 he again triumphed at St. Denis, but received the death-blow of which he died soon afterward at Paris. His eldest son, FRANÇOISE de Montmorency (1530-1579), was married to

Diana, natural daughter of Henry II.; another son, HENRI I. de Montmorency (1534-1614), was constable of France from 1593. HENRY II. (1595-1632), son of duke Henry I., succeeded to the title in 1614, having previously been raised by Louis XIII. to the office of grand admiral. In 1632 he joined the party of Gaston, duke of Orleans, and placed himself at the head of the rebel army, which was defeated by Marshal Schomberg at Castelnaudary (September 1, 1632); severely wounded, he fell into the enemy's hands, and, abandoned by Gaston, was executed as a traitor at Toulouse on October 30th. The title passed to his sister CHARLOTTE-MARGUERITE, princess of Condé.

MONTORO, a town of Spain, in the province of Cordova, twenty-seven miles to the north-northeast of that city, on the Madrid railway, stands on a rocky peninsula on the south bank of the Guadalquivir. The population of the ayuntamiento is 15,000.

MONTPELIER, the capital of Vermont (since 1805), and the county seat of Washington county (since 1811), is situated on the Winooski or Onion river, which falls into Lake Champlain. The State-house, in the form of a Greek cross with a dome and Doric portico, was erected at a cost of \$150,000, to replace the structure burned down in 1857. Under the portico stands a marble statue (by Larkin G. Mead) of Ethan Allen (1737-1789), the hero of Vermont. The State library contains 20,000 volumes. From 2,411 in 1860 the population has increased to 6,266 in 1901.

MONTPELLIER, chief town of the department of Hérault, France, is situated at the junction of several railway lines, on a small hill rising above the Lez, at its confluence with the Merdanson, about 480 miles south of Paris, and about seven miles from the Mediterranean. Population (1901), 76,364.

MONTPENSIER ANNE MARIE LOUISE D'ORLÉANS, DUCHESSE DE, was born at the Louvre on May 29, 1627. Her father was Gaston of Orleans, "Monsieur," the brother of Louis XIII., celebrated for the invariable ill fate which attended his favorites and partisans. Her mother was Marie de Bourbon, heiress of the Montpensier family. It was, perhaps, the greatest misfortune of her life that "Mademoiselle" (as her courtesy title went) was encouraged, or thought herself encouraged, to look forward to the throne of France as the result of a marriage with Louis XIV., who was, however, eleven years her junior. Ill-luck, or her own willfulness, frustrated numerous plans for marrying her to various persons of more or less exalted station, including Charles II. of England, then Prince of Wales. She was nearly forty, and had already corresponded seriously with Madame de Motteville on the project of establishing a ladies' society "sans mariage et sans amour," when a young Gascon gentleman named Puységur, afterward celebrated as M. de Lauzun, attracted her attention. It was some years before the affair came to a crisis, but at last, in 1670, Mademoiselle solemnly demanded the king's permission to marry Lauzun. Lauzun was imprisoned in Pignerol, and it was years before Mademoiselle was able to buy his release from the king by settling no small portion of her estates on Louis' bastards. The elderly lovers (for in 1681, when Lauzun was released, he was nearly fifty, and Mademoiselle was fifty-four) were then secretly married, if indeed they had not gone through the ceremony ten years previously. But Lauzun, a coarse and brutal adventurer, tyrannized over his wife, and her spirit, which was yet unbroken, at length got the better of her passion. It is said that on one occasion he addressed her thus, "Louise d'Orléans, tire-moi mes bottes," and that she at once and finally separated from him. She lived, however, for

some years after he had achieved his last adventure (that of assisting the family of James II. to escape from England, and attempting to defend their cause in Ireland), gave herself to religious duties, and finished her *Mémoires*, which extend to within seven years of her death (April 9, 1693), and which she had begun when she was in disgrace thirty years earlier.

MONTREAL, the largest city in the Dominion of Canada, its chief seat of commerce and principal port of entry, is situated on an island of about thirty miles in length and seven in breadth, at the confluence of the rivers Ottawa and St. Lawrence. It stands at the head of ocean navigation, 160 miles above Quebec, and nearly 1,000 miles (986) from the Atlantic Ocean, and lies at the foot of the great chain of river, lake, and canal navigation which extends westward through the great lakes. Montreal is built upon a series of terraces, the former levels of the river or of a more ancient sea. Behind those rises Mount Royal, a mass of trap-rock thrown up through the surrounding limestone strata to a height of 700 feet above the level of the river. From this rock the city derives its name, though its original founder, Paul de Chomedey, sire de Maisonneuve, in 1642, gave it the name of Ville-Marie. The modern city of Montreal occupies an area of about eight square miles—its principal streets running parallel with the river. On the north side of the mountain the Trenton limestone approaches the surface, and is there quarried for building purposes. Of this gray limestone most of the public edifices and many of the better class of private dwellings are built. The western slope of the mountain is occupied by the Côte des Neiges (Roman Catholic) cemetery, and the Mount Royal (Protestant) cemetery. The upper portion of the mountain, embracing an area of 430 acres, is now laid out as a public park, with fine drives, shaded by well-grown trees. On the east side the city occupies the slope toward the river St. Lawrence, which has here a breadth of from one to two miles. Two islands, the Nun's and St. Helen's Isles, the latter rising to a height of 150 feet, beautifully wooded, and laid out as a public park—occupy the bed of the river immediately below the Lachine Falls, and between them the river is spanned by the great Victoria Bridge. This is a tubular iron bridge supported on twenty-four piers of solid masonry, with the terminal abutments of the same, and measuring 9,184 feet in length. The river descends at the rate of seven miles an hour at the point where it is thus crossed; and the piers are constructed with a view to resist the enormous pressure of the ice in spring. The wharves and docks are crowded with shipping during the season of navigation, for the St. Lawrence is navigable to Montreal by the largest ocean steamers. But immediately above the city the river is impeded by a natural dyke of trap and limestone which here arrests the waters in their descent, forming the Lake St. Louis at a height of forty-four feet above the level of Montreal harbor. The river here forces its way through a channel of about half a mile wide, with a rapidity of about eighteen miles an hour, forming the Lachine or St. Louis rapids. Owing to the immense volume of water concentrated in a narrow channel, steamers drawing ten feet of water are safely navigated down the rapids, but these necessarily present an insuperable barrier to the ascent of the river. This is accordingly surmounted by means of the Lachine Canal which, commencing at the port of Montreal, passes round the falls by a series of locks, in a course of nine miles to Lake St. Louis, opposite the Indian village of Caughnawaga. The fall of water in the canal furnishes water-power for saw-mills, boiler and engine works, sash, blind, door, edge-tool, and other factories, established on its banks. Sugar-refining has also been carried on

here with great profit. Woolen and cotton mills, silk factories, a large rubber factory, rope and cordage works, boot and shoe factories, etc., are likewise organized on an extensive scale. The water supply of Montreal is derived from the river above the city; and, after passing along an open canal five miles in length, it is raised to a reservoir excavated out of the solid rock on the east slope of the Mountain, 205 feet above the level of the harbor.

The circumstances attendant on the foundation of Montreal, and the marked contrasts in its mixed population of French and English, give a peculiar character to its religious and benevolent institutions. This has led to the multiplication of churches, colleges, convents, and religious and charitable foundations, and to a rivalry in the zeal of their promoters, one result of which is seen in the scale and imposing character of many of their buildings. The Metropolitan Cathedral of St. Peter, designed to reproduce on a reduced scale the chief features of St. Peter's at Rome, was projected by Bishop Bourget after the destruction of his church and palace in the great fire of 1852. It occupies a prominent site in Dorchester street, at the corner of Dominion Square. The parish church of Notre-Dame, on the Place d'Armes, affords accommodation for 10,000 worshippers. The Jesuits' Church is another large church, elaborately painted in the interior. Near it is the College of St. Mary. Christchurch Cathedral (Protestant) is a fine specimen of Decorated Gothic, built, externally, of the native limestone, but with the chief facings and carvings of the exterior and the whole of the interior of fine Caen stone.

The Hôtel Dieu, founded in 1644 for the cure of the sick, now occupies a building at the head of St. Famille street. The order of the Grey Nuns, founded in 1737, have built a new hospital in Guy street. The professed sisters of this religious community, numbering at present 310, receive under their care the aged and infirm, and the orphan and foundling children of the French Canadian population. They also undertake the care of various asylums and schools in different parts of the city. Montreal has also a General Hospital, founded in 1822; a Protestant House of Industry, the Mackay Institution for Deaf-Mutes, the Protestant Orphan Asylum, Infants' Home, etc. The curiously mixed character of the population of Montreal is further shown in its separate daily and weekly newspapers in the English and French languages, and in its various national societies, of St. George, St. Andrew, St. Patrick, St. Jean Baptiste, and New England—each confining its charitable operations to those of the nationality which it represents. There are two theaters in Montreal.

Among the chief civic buildings is the city hall, built in the modern French style, with lofty mansard roofs, and a central pavilion.

Foremost among the educational institutions is the university of McGill College, founded by James McGill, a Scotchman, who in the later years of the eighteenth century engaged in the northwest fur trade, and ultimately became one of the leading merchants in Montreal. At his death, in 1813, he left his property for the founding of a college. The most recent and liberal addition to it is the Peter Redpath Museum, valued at upward of \$100,000, the gift of a wealthy citizen. The university embraces the faculties of arts, law, and medicine, and has also a department of practical science. The Seminary of St. Sulpice is a theological training school for priests, where the larger portion of the Roman Catholic clergy of the province of Quebec have received their training, and also a college where a large number of the French Canadian youth receive their education. **This seminary is held in high esteem, and attracts many**

Roman Catholic students from the United States. Laval University, which has its chief seat at Quebec, has also a branch at Montreal, with a large staff of professors, chiefly in theology, law, and medicine. The McGill and the Jacques Cartier Normal Schools for training teachers for the Protestant and Roman Catholic public schools are conducted under the Protestant and Roman Catholic boards of public instruction; and model schools attached to them afford the requisite practical training for teachers.

The commerce of Montreal is well represented by the architectural character of its banking establishments and many of the large mercantile houses. It is also the seat of a large manufacturing industry. But the most substantial evidence of its importance as a commercial center is its harbor. The solidly-built basins, wharves, quays, and canal locks extend for upward of a mile and a half along the river side. Direct grain exports in 1900 equaled 14,843,175 bushels, an increase of over 4,000,000 bushels over 1898. The harbor revenues in 1900 were \$305,000. The receipts of grain, flour and meal in 1899 were 28,722,865 bushels. The business of the port is thus expressed in Canadian currency: total value of exports \$42,638,270; of imports, \$67,191,888; customs duties collected, \$12,321,981. The number of sea-going vessels in port was 695, of which fully one-half were ocean steamers. The estimated value of real estate in Montreal is \$105,978,930. The population in 1851 numbered 57,715; in 1891 it had increased to 216,644, and is now (1901) 267,730.

The city returns three members to the Canadian House of Commons, and the same number to the provincial legislature of Quebec.

When the first French explorers landed on the island of Montreal under the leadership of Jacques Cartier in 1535, a large Indian palisaded town existed a little to the west of Mount Royal, and not far from the present English cathedral. To this fortified town the Indians gave the name of Hochelaga, and Jacques Cartier describes it as surrounded by fields of grain and other evidences of a settled native population. The name is now applied to the eastern suburb of the modern city. The early history of Montreal is largely occupied with incidents of Indian warfare. In 1665 the marquis de Tracy arrived from France, bringing with him a regiment of French soldiers, with whose aid the Indian assailants were driven off, and forts erected and garrisoned to repel their incursions; thus protected, Montreal became the center of the fur trade with the west, and entered on its history as a commercial city. In 1722 it was fortified with a bastioned wall and ditch, under the directions of De Lery; and the citadel was erected on a height now laid out as Dalhousie Square. The taking of Quebec by the English under General Wolfe in 1759 was followed ere long by the surrender of Montreal. Since that date it has rapidly developed as an important center of commercial and manufacturing enterprise.

MONTROSE, a royal and parliamentary borough and seaport of Forfarshire, Scotland. Population (1901), about 17,500.

MONTROSE, JAMES GRAHAM, MARQUIS OF, born in 1612, became the fifth earl of Montrose by his father's death in 1626. He was educated at St. Andrews; and in 1629, at the early age of seventeen, he married Magdalene Carnegie, daughter of the earl of Southesk. In 1636, on his way home from a prolonged visit to the Continent, he sought an introduction to Charles I., but, as it is said, was frustrated in his hope of obtaining the king's favor by an intrigue of the marquis of Hamilton. Not long after the outbreak of the Scottish troubles in 1637 he joined the party of resistance, and was for some time its most energetic champion. He signed the

Covenant, and became one of the foremost Covenanters. The part assigned to him was the suppression of the opposition to the popular cause which arose around Aberdeen and in the country of the Gordons. Three times, in July, 1638, and in March and June, 1639, Montrose entered Aberdeen, where he thoroughly succeeded in effecting his object, on the second occasion carrying off the head of the Gordons, the marquis of Huntly, as a prisoner to Edinburgh.

In July, 1639, after the signature of the treaty of Berwick, Montrose was one of the Covenanting leaders who visited Charles upon the borders. After the invasion of England had been crowned with success, Montrose still continued to cherish his now hopeless policy. On May 27, 1641, he was summoned before the Committee of Estates charged with intrigues against Argyll, and on June 11th he was imprisoned in Edinburgh Castle. When Charles visited Scotland to give his formal assent to the abolition of Episcopacy, Montrose communicated to him his belief that Hamilton was a traitor.

For a time Montrose retired, not voluntarily, from public life. After the Civil War in England began he constantly pressed Charles to allow him to make a diversion on Scotland. At last in 1644, when the Scottish army entered England to take part against the king, Montrose, now created a marquis, was allowed to try what he could do. He set out to invade Scotland with about 1,000 men. But his followers deserted, and his position appeared hopeless. Montrose did not miscalculate his chances. The clans rallied to his summons. About 2,000 Irish crossed the sea to assist him. He won battle after battle. He defeated the Covenanters at Tippermuir on September 1st, and at the Bridge of Dee on September 12th. The Scottish parliament declared Montrose to have forfeited his life and estate as a traitor, but it could not reach him to execute the sentence. In the name of the king, who now appointed him lord-lieutenant and captain-general of Scotland, he summoned a parliament to meet at Glasgow on October 20th, in which he no doubt hoped to reconcile loyal obedience to the king with the establishment of a non-political Presbyterian clergy. That parliament never met. In England Charles was in evil plight. He had been defeated at Naseby on June 14th, and Montrose must come to his help if there was to be still a king to proclaim. He never had a chance of knowing what Montrose could do against the "new model" army. David Leslie, the best of the Scottish generals, was dispatched against Montrose to anticipate the invasion. On September 12th he came upon Montrose, deserted by his Highlanders, and guarded only by a little group of followers at Philiphaugh. He won an easy victory. Montrose cut his way through to the Highlands; but he failed to reorganize an army. On September 3, 1646, he embarked for Norway.

Montrose was to appear once more on the stage of Scottish history. In June, 1649, he was restored by the exiled Charles II. to his nominal lieutenant-governorship of Scotland. In March, 1650, he landed in the Orkneys to take the command of a small force which he had sent on before him. Crossing to the mainland, he tried to raise the clans, but the clans would not rise, and on April 27th he was surprised and captured at Corbiesdale in Ross-shire. On May 18th he entered Edinburgh as a prisoner. On the 20th he was sentenced to death by the parliament, and he was hanged on the 21st.

MONT ST. MICHEL, a curious rocky islet, consisting of a mass of granite about 3,000 feet in compass and 165 feet in height, rises at a distance of nearly a mile from the shore in the bay of St. Michel, near the mouth of the Couësson, at the vertex of the angle formed by the

coasts of Brittany and Normandy. The quicksands by which it is surrounded, and which stretch far to seaward, are exposed at low water, and highly dangerous to those who venture on them without a guide.

MONTSERRAT, one of the Leeward Islands in the West Indies, is twelve miles long and eight broad in its widest part, and has an area of thirty-two square miles. The island was discovered by Columbus in 1493, and received its name either because of its broken appearance or after the mountain in Spain. It was colonized by the English under Sir Thomas Warner in 1632, and was taken by the French in 1664. Restored to the English in 1668, it capitulated to the French in 1782, but was again restored in 1784. It is now a presidency under the general government at Antigua, and has a legislative council, composed of officials and crown nominees. The population (1901) of 12,215 consists principally of negroes, with several hundred whites.

MONTSERRAT. Thirty miles to the northwest of Barcelona, in Spain, there rises a very remarkable mountain of gray conglomerate, twenty-four miles in circumference, and at its loftiest point (San Geronimo) a little more than 4,000 feet in height. The mountain consists of jagged pinnacles and spires rising abruptly from the base of the mass, which is cloven with many clefts, and abounds with steep precipices. It is the *Mons Serratus* of the Romans, the *Monte Serrado* of the Spaniards, and is thus named, either in allusion to its jagged appearance, like the teeth of a saw, or because the eastern face is split, as if sawn—which occurred, say the Spanish legends, at the time of the crucifixion, when the rocks were rent. The arms of the monastery represent a mountain with a saw resting upon it and penetrating some distance into its mass.

MONTUCLA, JEAN-ÉTIENNE, a learned mathematician, was born at Lyons in 1725, and died in 1799.

MONZA (locally Monscia), a city of Italy in the province of Milan, at the branching of the railway for Lecco and Como, lies on the Lambro, a tributary of the Po. Population about 16,000.

MOOLTAN. See MÚLTÁN.

MOON, THE. The subject of the moon divides itself into two separate branches, the one concerned with the constitution of the lunar globe, the other with its motions. For the first subject the reader is referred to the article ASTRONOMY; the present article is confined to the second, which is commonly called the *Lunar Theory*.

The lunar theory does not yet form a well-defined body of reasoning and doctrine, like other branches of mathematical science, but consists only of a series of researches, extending through twenty centuries or more, and incapable of being welded into a consistent whole. This state of things arises from the inherent difficulties and complexities of the subject, and from the fact that no one method or system has yet been discovered by which all the difficulties can be surmounted and all the complexities disentangled. Hence each investigator, when he has desired to make any substantial advance beyond his predecessors, has been obliged to take up the subject from a new point of view, and to devise such method as might seem to him most suitable to the special object in hand. The historical treatment is therefore that best adapted to give a clear idea of the results of these investigations. The ancient and modern histories of the subject are quite distinct, the modern epoch commencing with Newton. The great epoch made by Copernicus did not extend to the case of the moon at all, because in every investigation of the moon's motion, modern as well as ancient, the motion is referred to the earth as a center. Hence the heliocentric system introduced no new conception of



FULL MOON, EXHIBITING BRIGHT STREAKS RADIATING FROM TYCHO

this motion, except that of taking place round a moving earth instead of round a fixed one. This change did not affect the consideration of the relative motion of the earth and moon, with which alone the lunar theory is concerned. The two stages of the lunar theory are, therefore, that in which the treatment was purely empirical, and that in which it was founded rationally on the law of gravitation.

It is in the investigation of the moon's motion that the merits of ancient astronomy are seen to the best advantage. In the hands of Hipparchus the theory was brought to a degree of precision which is really marvellous when we compare it, either with other branches of physical science in that age, or with the remarks and speculations of contemporary non-scientific writers. Whether this was wholly the work of Hipparchus, or whether he simply perfected a system already devised by his predecessors, it is now impossible to say; but, so far as certain knowledge extends, the works of his predecessors did not embrace more than the determination of the mean motion of the moon and its nodes. Although the general fact of a varying motion may have been ascertained, the circumstances of the variation had probably never been thoroughly investigated.

The modern lunar theory commenced with Newton, and consists in determining the motion of the moon deductively from the theory of gravitation. But the great founder of modern mechanics did not employ the method best adapted to lead to the desired result, and hence his efforts to construct a lunar theory are of more interest as illustrations of his wonderful power and correctness in mathematical reasoning than as germs of new methods of research. He succeeded perfectly in explaining the elliptic motion of two mutually attracting bodies round their common center of gravity by geometrical constructions. But when the problem was one of determining the variations from the elliptic motion which would be produced by a third body, such constructions could lead only to approximate results. The path to modern methods was opened up by the Continental mathematicians, whose great work consisted in reducing the problem to one of pure algebra.

In the researches on the lunar theory before Delaunay the principal force was taken to be the attraction of the earth upon the moon, and the disturbing force was that due to the sun's attraction. When the action of the earth alone was included the moon would move in an ellipse, in accordance with Kepler's laws. The effect of the sun's action could be allowed for by supposing this ellipse to be movable and variable. But when it was required to express this variation the problem became excessively complicated, owing to the great number of terms required to express the sun's disturbing force. Now, instead of passing from the elliptic to the disturbed motion by one single difficult step, Delaunay effected the passage by a great number of easy steps. Out of several hundred periodic terms, the sum of which expressed the disturbing force of the sun, he first took one only, and determined the variations of the Keplerian ellipse on the supposition that this term was the only one. In the solution the variable elements of the ellipse would be expressed in terms of six new constants. He then showed how these new constants could be taken as variables instead of the elements of the original ellipse. Taking a second term of the disturbing force, he expressed the new constants in terms of a third set of constants, and so repeated the process until all the terms of the disturbing force were disposed of.

MOORCROFT, WILLIAM, traveler in Asia, was born in Lancashire, England, about 1770 and died in 1825.

MOORE, EDWARD, minor poet, was the son of a dissenting minister of Abingdon, where he was born in 1712. He was the author of the thrilling domestic tragedy of *The Gamester*, originally produced in 1753 with Garrick in the leading character, and still in the repertory of acting plays. Moore also wrote two comedies. As a poet he produced clever imitations of Gay and Gray, and with the assistance of Lyttelton, Chesterfield, and Horace Walpole conducted *The World* (1753-57) during the great decade of the revival of periodical essay-writing. *The World* followed Johnson's *Rambler*, and was followed by *The Idler*; it had as rivals *The Adventurer* and *The Connoisseur*. Moore died at London in 1757.

MOORE, DR. JOHN, born at Stirling in 1730, was one of the most prominent writers of travels and novels in the latter part of the eighteenth century. His novel *Zeluco* (published in 1789) produced a powerful impression at the time, and indirectly, through the poetry of Byron, has left an abiding mark on literature. He was a doctor by profession, and the son of a Stirlingshire clergyman. After taking his medical degree at Glasgow, he served with the army in Flanders, then was attached to the household of the English ambassador at Paris, then practiced for five years in Glasgow, next traveled on the Continent for five years with a young nobleman, settled for some years as a physician in London, accompanied Lord Lauderdale to Paris in 1792 and witnessed some of the principal scenes of the Revolution. He died at London in 1802.

MOORE, SIR JOHN, the only English general who has gained lasting fame by the conduct of a retreat, was the son of Doctor Moore (the subject of the preceding notice), and was born at Glasgow, November 13, 1761. In 1788 he was promoted to a majority in the fifty-first regiment, and in 1790 he became lieutenant-colonel and resigned his seat in parliament. In the Irish rebellion of 1798 he distinguished himself by his activity in saving Wexford from destruction after the battle of Vinegar Hill. His services were in a universal request, and Abercromby insisted upon his serving with him in the expedition to the Helder in 1799, where he did creditably all that was creditably done in that ill-managed expedition. On his return from Holland he was made colonel of the fifty-second regiment, and in 1800 accompanied Abercromby to the Mediterranean as major-general.

In May, 1808, he was ordered with a force of 11,000 men to Sweden to assist the king against the united forces of France and Russia. The mad conduct of the Swedish king, however, who even went so far as to declare Sir John Moore under arrest when he refused to acquiesce in his plans, ruined any chance of successful coöperation, and the English general made his escape and returned to England. He was at once ordered to proceed with his division to Portugal, where Sir Arthur Wellesley had already landed.

Now began the glorious three months on which Moore's reputation as a soldier and a statesman must rest. The Spaniards, flushed with their former success at Baylen, regarded Napoleon, who had in person crossed the Pyrenees, as another Dupont, and loudly summoned Moore to a share in their coming victories. Moore knew better what was the value of Napoleon's genius, but he had been commanded to assist the Spaniards, and therefore gave the order to advance. His army marched in four distinct divisions, and on November 13, 1808, he concentrated at Salamanca, where he waited to see what would happen. He heard that a subsidiary force under Sir David Baird had arrived at Coruña, and ordered it up to join him. Having once drawn Napoleon's attention to himself, he began his famous retreat and fell back quickly, fighting

every day and invariably with success. To detail each step of the retreat and every skirmish would be but to rewrite Napier; suffice it to say that, with great loss of life and material, Moore reached Coruña on January 12, 1809. But the fleet to take the army home was not there; and the English would have to fight Soult, whose army was even more weakened and demoralized than Moore's, before they could embark. It was on January 16th that Moore fought his last battle; he fell early in the day, and knew at once that his wound was mortal.

MOORE, THOMAS, born at Dublin on May 28, 1779, fairly shares with Lord Byron the honor of being the most popular poet of his generation. Whatever may be thought now of the intrinsic qualities of his verse, this much cannot be denied. Much of Moore's success was due to his personal charm. This at least gave him the start on his road to popularity. There is not a more extraordinary incident in the history of our literature than the instantaneousness with which the son of a humble Dublin grocer, on his first visit to London, captivated the fashionable world and established himself in the course of a few months as one of its prime favorites. Before he left school he had acquired fame in his own circle as a song-writer, and had published, in the *Anthologia Hibernica*, verses "to Zelia on her charging the author with writing too much on love." This was in 1793. In that year the prohibition against Catholics entering Trinity College was removed, and next year Moore took advantage of the new freedom. As one of the first Catholic entrants, he had an exceptional stimulus to work, and there industriously acquired that classical scholarship with which he won the hearts of such learned Whigs as Lansdowne and Holland, while he charmed fashionable ladies with the grace of his songs.

Moore was fairly established in London society in the first year of the century, and from that time the hope of its applause was the ruling aspiration of his life and its judgment the standard of his work. Through Lord Moira's influence he was appointed registrar of the admiralty court in Bermuda, in 1803. He went there to take possession, but four or five months of West India society, jingling pianofortes, and dusky beauties bored him excessively, and he appointed a deputy and returned to London, after little more than a year's absence. The office continued to bring him about £400 a year for fourteen or fifteen years, but at the end of that time embezzlement by the deputy, for whom he was responsible, involved him in serious embarrassment. This was all that Moore received from his great political friends—no great boon as things went in the days of patronage. The poet's long-deferred hopes were finally extinguished in 1812, when Lord Moira, under the Liverpool administration, went out as governor-general to India without making any provision for him. From that time Moore set himself in earnest to make a living by literature, his responsibilities being increased by his marriage in 1811. From his boyhood to 1812 may be called the first period of Moore's poetical activity. He had formed the design of translating Anacreon while still at college, and several of the pieces published in 1801 under the *nom de plume* of "Thomas Little" were written before he was eighteen. "Little's" songs at once became the rage in every drawing-room. He found his songs in Virginia when he landed there on his way to Bermuda. And not only were his songs sung, but his poems were read, passing rapidly through many editions.

His publication of 1806 was savagely reviewed in the *Edinburgh* by Jeffrey, who accused him of a deliberate design to corrupt the minds of innocent maidens with his wanton fancies, and who had in consequence to

figure in a ludicrous attempt at a duel—ludicrous in its circumstances, though Moore was ferociously in earnest. We may well acquit Moore of the diabolic intention attributed to him, but Jeffrey's criticism of his poetry as poetry was just enough. The only parts of the volume that Jeffrey praised were the satirical epistles. The vein essayed in these epistles Moore pursued afterward in his *Corruption*, *Intolerance* (1808), and *The Sceptic*, a philosophical satire (1809), but as long as he kept to the heroic couplet and the manner of Pope he could not give full scope to his peculiar powers as a satirist. Of all the poetical enterprises that Moore undertook, none was so exactly suited to his powers as the task proposed to him by the publisher Power of supplying fit words to a collection of Irish melodies. The first number appeared in 1807, and it was so successful that for twenty-seven years afterward writing words to music was one of Moore's most regular occupations and his steadiest source of income, Power paying him an annuity of £500. Six numbers of Irish melodies were published before 1815; then they turned to sacred songs and national airs, issuing also four more numbers of Irish melodies before 1834. Moore entered into this work with his best and most practiced powers and with all his heart. From his boyhood he had been in training for it.

The regent's desertion of the Whigs in 1812 cut them off from all hope of office for many years to come, and Moore from his last hope of a snug sinecure, when Lord Moira also was practically oblivious of him. There was at once a marked increase in his literary fertility, and he broke ground in a new field, which he cultivated with preëminent success—political squib-writing. Moore was incapable of anything like rancor, but he felt the disappointment of his hopes enough to quicken his fancy and sharpen the edge of his wit. Moore opened fire in the *Morning Chronicle*, and crowned his success next year (1813) with a thin volume of "Intercepted Letters," *The Twopenny Post Bag*. A very little knowledge of the gossip of the time enables us to understand the delight with which Moore's sallies were received in the year which witnessed the imprisonment of Leigh Hunt for more outspoken attacks on the regent. Moore received every encouragement to work the new vein. He was at one time in receipt of a regular salary from the *Times*; and his little volumes of squibs published at intervals—*The Fudge Family in Paris*, 1818; *The Journal of a Member of the Poccourante Society*, 1820; *Fables for the Holy Alliance*, 1823; *Odes on Cash, Corn, Catholics, and other Matters*, 1828; *The Fudges in England*, 1835—went through many editions. The prose *Memoirs of Captain Rock* (1824) may be added to the list. Moore's only failure was *Tom Cribb's Memorial to Congress* (1819), for which he had made an elaborate study of thieves' slang. It was of course on the side of the Whigs that Moore employed his pen, and his favorite topics were the system of repression in Ireland and the disabilities of the Catholics.

The disappointment of 1812, which started Moore on his career as a squib-writer, nerved him also to a more sustained effort in serious verse than he had before attempted. *Lalla Rookh* would never have been written if the author's necessities had not compelled him to work. To keep himself at the oar, he contracted with the Longmans to supply a metrical romance on an Eastern subject, which should contain at least as many lines as Scott's *Rokeby*, and for which the publishers bound themselves to pay 3,000 guineas on delivery. The poem was not published till May, 1817. Moore, as was his habit, made most laborious preparation, reading himself slowly into familiarity with Eastern

scenery and manners. The confidence of the publishers was fully justified. Moore's contemporaries were dazzled and enchanted with *Lalla Rookh*. His next Orientalism, the *Loves of the Angels*, published in 1822, was hardly less popular than *Lalla Rookh*. The artificiality of the manufacture was shown by the ease with which, after a few editions, he changed his angels from Jews into Turks, to evade a charge of impiety which was supposed to impede the sale of the work.

It was a misfortune for the comfort of the last twenty years of Moore's life that he allowed himself to be drawn into a project for writing the "History of Ireland" in *Lardner's Cyclopædia*. Scott and Mackintosh scribbled off the companion volumes on Scotland and England with very little trouble, but Moore had neither their historical training nor their dispatch in writing. The history sat like a nightmare on Moore for fifteen years, and after all was left unfinished on the melancholy collapse of his powers in 1845. From the time he burdened himself with it Moore did very little else, beyond a few occasional squibs and songs, the last flashes of his genius, and the *Travels of an Irish Gentleman in Search of a Religion*, although he had had tempting offers of more lucrative and, it might have been thought, more congenial work. Moore's last years were harassed by the weakness and misconduct of his sons, and by pecuniary embarrassments. An annual pension of £300 was conferred upon him in 1833, and he had always received large sums for his work; but, while waiting for the sinecure which never came, he had contracted an unfortunate habit of drawing upon his publishers in advance. After the death of his last child in 1845, Moore became a total wreck, but he lingered on till February 26, 1852.

MOOR-HEN, the name by which a bird, often called Water-hen and sometimes Gallinule, is most commonly known in England.

MOOSE. See DEER.

MORADABAD. See MURADABAD.

MORAL PHILOSOPHY. See ETHICS.

MORATIN, LEANDO FERNANDEZ DE, Spanish dramatist and poet, was born at Madrid in 1760 and died in 1828.

MORATIN, NICOLAS FERNANDEZ DE, Spanish poet, was born at Madrid in 1737, and died in 1780.

MORAVIA (in German MÄHREN), a margraviate and crownland in the Cisleithan part of the Austrian-Hungarian empire. Its superficial extent is about 8,580 square miles. Physically Moravia may be described as a mountainous plateau sloping from north to south, and bordered on three sides by mountain ranges of considerable elevation. Almost the whole of Moravia belongs to the basin of the March or Morava, from which it derives its name, and which, after traversing the entire length of the country in a course of 140 miles and receiving numerous tributaries (Thaya, Hanna, etc.), enters the Danube at Pressburg. The Oder rises among the mountains in the northeast of Moravia, but soon turns to the north and quits the country. With the exception of a stretch of the March none of the rivers are navigable. Moravia is destitute of lakes, but contains numerous large ponds.

Moravia belongs to the group of old Slavonic states which had preserved their nationality while losing their political independence. Upward of 70 per cent. of the inhabitants are Slavs who are scarcely distinguishable from their Bohemian neighbors. The differences in dialect between the two countries are very slight, and are being gradually lost in a common literary language. The name of Czech, however, is usually reserved for the Bohemians, while the Slavs of Moravia and West Hungary are called Moravians and Slovaks. The Ger-

mans form about 26 per cent. of the population, and are found mostly in the towns and in the border districts. The Jews are the best educated of the inhabitants, and in a few small towns form a full half of the population. Their sympathies generally lie with the Germans. In 1901 the population was 2,437,706, showing an increase of 136,133 since 1869. Moravia is one of the most densely-populated parts of Austria-Hungary, the proportion being 252 persons per square mile. About 12 per cent. of the births are illegitimate. The chief towns are Brünn, the capital and industrial center (109,346 inhabitants), Olmütz, a strong fortress defending the "Moravian Gate" (20,176 inhabitants), Znaim and Iglaue.

MORAVIAN BRETHREN, THE, are a society of Christians whose history can be traced back to the year 1457 and their origin found among the religious movements in Bohemia which followed the martyrdom of John Huss by the council of Constance. The beginnings of the Bohemian Brethren (for that was their earlier name) are somewhat obscure. The followers of Huss broke up into two factions, one of which, the Calixtines, was willing to acknowledge allegiance to Rome, provided the "compacts" of the council of Basel permitting the Lord's Supper *sub utraque specie* were maintained, and in the end it became the national church of Bohemia; the other, the Taborites, refused all terms of reconciliation, and appealed to arms. Separate from both these were many pious people who were content to worship God in simple fashion, in quiet meetings for prayer and Scripture-reading, like the *Gottesfreunde* of Germany, and who called themselves *Brethren*. Bohemian historians have conclusively shown that the Brethren represent the religious kernel of the Hussite movement, and do not come either from the German Waldenses or from the Taborites.

MORAYSHIRE. See ELGIN.

MORBIHAN, a department of western France, formed of a part of Lower Brittany, lies on the Atlantic seaboard, being bounded southeast by the department of Loire-Inférieure, east by that of Ille-et-Vilaine, north by Côtes. Pop. (1901), 557,934.

MORDAUNT, CHARLES. See PETERBOROUGH, EARL OF.

MORDVINIANS, more correctly MORDVA or MORDVS, are a people numbering about 1,000,000, of Finnish origin, belonging to the Ural-Altaic family, who inhabit the middle Volga provinces of Russia and spread in small detached communities to the south and east of these. Their settlement in the basin of the Volga is of high antiquity.

MORE, HANNAH, who was born at Stapleton near Bristol in 1745, may be said to have made three reputations in the course or her long life: first, as a clever verse-writer and witty converser in the circle of Johnson, Reynolds, and Garrick; next, as an animated writer on moral and religious subjects on the Puritanic side; and lastly, as a practical philanthropist. She died at Clifton on September 7, 1833.

MORE, HENRY, one of the most remarkable and interesting of the "Cambridge Platonists," was born at Grantham in Lincolnshire in the year 1614, and died September 1, 1687.

MORE, THOMAS, lord chancellor, and one of the most illustrious Englishmen of his century, was born in London, February 7, 1478. About the age of twenty More was seized with a violent access of devotional rapture. This access of the ascetic malady lasted but a short time, and More recovered, to all outward appearance, his balance of mind. But he never entirely emancipated himself from the sentiment of devotion, though in later life it exhibited itself in a more rational form. The dates

as regards More's early life are uncertain, and we can only say that it is possible that the acquaintance with Erasmus might have begun during Erasmus' first visit to England in 1499. As early as 1502 he was appointed under-sheriff of the city of London, an office then judicial, and of considerable dignity. He first attracted public attention by his conduct in the parliament of 1504 by his daring opposition to the king's demand for money. Henry VII. was entitled, according to feudal laws, to a grant on occasion of his daughter's marriage. But he came to the House of Commons for a much larger sum than he intended to give with his daughter. The members, unwilling as they were to vote the money, were afraid to offend the king, till the silence was broken by More, whose speech is said to have moved the House to reduce the subsidy of three-fifteenths which the government had demanded to £30,000. One of the chamberlains went and told his master that he had been thwarted by a beardless boy. Henry never forgave the audacity; but, for the moment, the only revenge he could take was upon More's father, whom, upon some pretext, he threw into the Tower, and only released him upon payment of a fine of £100. Thomas More found it advisable to withdraw from public life into obscurity. During this period of retirement the old dilemma recurred. One while he devoted himself to the sciences, "perfecting himself in music, arithmetic, geometry and astronomy, learning the French tongue, and recreating his tired spirits on the viol," or translating epigrams from the Greek anthology; another while resolving to take priest's orders.

From dreams of clerical celibacy he was roused by making acquaintance with the family of John Colt of New Hall, in Essex. The "honest and sweet conversation" of the daughters attracted him, and though his inclination led him to prefer the second he married the eldest, not liking to put the affront upon her of passing her over in favor of her younger sister. The death of the old king in 1507 restored him to the practice of his profession, and to that public career for which his abilities specially fitted him. From this time there was scarce a cause of importance in which he was not engaged. It was not long before he attracted the attention of the young king and of Wolsey. The spirit with which he pleaded before the Star Chamber in a case of the Crown *v.* the Pope, recommended him to the royal favor, and marked him out for employment. More obtained in this case judgment against the crown. Henry, who was present in person at the trial, had the good sense not to resent the defeat, but took the counsel to whose advocacy it was due into his service. In 1514 More was made master of the requests, knighted, and sworn a member of the privy council.

In 1529 he was made lord chancellor. Unfortunately for Sir Thomas More, a lord chancellor is not merely a judge, but has high political functions to perform. In raising More to that eminent position, the king had not merely considered his professional distinction, but had counted upon his avowed liberal and reforming tendencies. But in the king's mind the public questions of reform were entirely sunk in the personal one of the divorce. The divorce was a point upon which Sir Thomas would not yield. And, as he saw that the marriage with Anne Boleyn was determined upon, he petitioned the king to be allowed to resign the great seal, alleging failing health. With much reluctance, the royal permission was given and the resignation accepted, May 10, 1532.

But More was too conspicuous to be long allowed to enjoy the happiness of a retired life. A special invitation was sent him by the king to attend the coronation of Anne Boleyn, accompanied with the gracious offer of

£20 to buy a new suit for the occasion! More refused to attend, and from that moment was marked out for vengeance. A first attempt made to bring him within the meshes of the law only recoiled with shame upon the head of the accusers. They were maladroit enough to attack him on his least vulnerable side, summoning him before the privy council to answer to a charge of receiving bribes in the administration of justice. The charges were refuted triumphantly. But the very futility of the accusations must have betrayed to More the bitter determination of his enemies to compass his destruction.

In 1534 the Act of Supremacy was passed, and the oath ordered to be tendered. More was sent for to Lambeth, where he offered to swear to the succession, but steadily refused the oath of supremacy as against his conscience. Thereupon he was given in charge to the abbot of Westminster, and, persisting in his refusal, was four days afterward committed to the Tower. After a close and even cruel confinement (he was denied the use of pen and ink) of more than a year, he was brought to trial before a commission on a charge of high treason. Even so More would have been acquitted, when at the last moment Rich, the solicitor-general, quitted the bar and presented himself as a witness for the crown. Being sworn, he detailed a confidential conversation he had had with the prisoner in the Tower. He affirmed that, having himself admitted in the course of this conversation "that there were things which no parliament could do—*e.g.*, that no parliament could make a law that God should not be God," Sir Thomas had replied, "No more could the parliament make the king supreme head of the church." By this act of perjury a verdict of "guilty" was procured from the jury. The execution of the sentence followed within the week, on July 7, 1535.

MOREAU, HÉGÉSIPPE, a minor lyric poet of disputed but considerable talent, was born at Paris on April 9, 1810, and died in the hospital of La Charité on December 10, 1838.

MOREAU, JEAN VICTOR, the greatest general of the French republic after Napoleon and Hoche, was born at Morlaix in Brittany in 1763. In 1792, at the call for volunteers he organized a battalion, and was at once elected its commandant. With it he served under Dumouriez, and in 1793 the good order of his battalion, and his own martial character and republican principles secured his promotion as general of brigade. Carnot, who had an eye for the true qualities of a general, promoted him to be general of division in 1794, and gave him command of the right wing of the army which, under Pichegru, was destined to drive the English and Austrians out of Flanders by separating the Austrians from the English. This wing was then to cover the occupation of Holland by the main army under Pichegru. These operations established his military fame, and in 1795 he was given the command of the army of the Rhine and the Moselle, with which he crossed the Rhine and advanced into Germany. He was at first completely successful, and won several victories, but at last had to execute before the archduke Charles a retreat which only increased his fame, as he managed to bring back with him more than 5,000 prisoners. In 1797 he again crossed the Rhine, but his operations were checked by the conclusion of the preliminaries of Leoben between Bonaparte and the Austrians. It was at this time he found out the traitorous correspondence between his old comrade and commander Pichegru and the prince de Condé, which he foolishly concealed, and naturally he has ever since been suspected of at least partial complicity. After Fructidor the Directory ceased to employ his service, until the absence of Bonaparte and the advance of Suwaroff made it necessary to have some great

general in Italy. Yet it was only as chief of the staff that he served under Scherer and Joubert, and led back the French army after the latter's death at Novi. When Bonaparte returned from Egypt he found Moreau at Paris, greatly dissatisfied with the Directory both as a general and as a republican, and obtained his assistance in the *coup d'état* of Brumaire, when Moreau commanded the force which occupied the Luxembourg. In reward, the first consul again gave him command of the army of the Rhine, with which he fought his last great campaign, that of Hohenlinden, when his success was due rather to the splendid military qualities of his generals and their troops, and his own tactical genius, than to any inspiration of victory. On his return to Paris he married Mdlle. Hulot, an ambitious woman, who gained a complete ascendancy over him, and with the enormous fortune acquired during his campaigns he purchased a luxurious hotel in Paris and also Barras' country-seat of Grosbois. His wife exercised an evil influence over him, and collected around her all who were discontented with the aggrandizement of Napoleon. This "club Moreau" frightened Napoleon, and encouraged the royalists; but Moreau, though not unwilling to become a military dictator to restore the republic, would not intrigue for the restoration of Louis XVIII. All this was well known to Napoleon, who seized the conspirators. Moreau he treated with real leniency, and permitted to retire first to Spain, and then to America. Here the general lived in great content for seven years, when his wife, who could not allow him to rest, made him enter into negotiations with Bernadotte, his old comrade, who was now crown-prince of Sweden. At his suggestion Moreau entered the service of the czar Alexander; and with Bernadotte he planned the campaign of 1813. Fortunately for his fame as a patriot he did not live to invade France, but was mortally wounded while talking to the czar at the battle of Dresden on August 27, 1813, and died on September 2d.

MOREL or MORCHELLA. See MUSHROOM.

MORELIA, formerly VALLADOLID, a city of Mexico, capital of the State of Michoacan de Ocampo, is situated 125 miles west-by-north of Mexico. In 1750 the city had about 18,000 inhabitants, in 1873 the municipality had 36,940 and the city proper about 30,000, and in 1900 the number is stated at 35,000.

MORELLET, ANDRÉ, economist and miscellaneous writer, was born at Lyons in 1727, and died in 1819.

MORETO, AGUSTIN, Spanish dramatist and playwright, was born at Madrid in 1618, and died in 1669.

MORETTO, IL ("The Blackamoor," a term which has not been particularly accounted for), is the name currently bestowed upon ALESSANDRO BONVICINO, a celebrated painter of Brescia, Venetian school. He was born at Rovato in the Brescian territory in 1498. His death took place toward 1560.

MORGAGNI, GIOVANNI BATTISTA, the founder of pathological anatomy, was born February 25, 1682, at Forlì, an ancient and important town on the Æmilian road southward from Bologna. He died in 1771.

MORGAN, SYDNEY OWENSON, LADY, novelist and miscellaneous describer and critic, was one of the most vivid and hotly-discussed literary personages of her generation. She was born in 1777 and died in 1859.

MORGANATIC MARRIAGE. See MARRIAGE.

MORGHEN, RAFFAELLO SANZIO, a distinguished engraver, was born at Naples on June 19, 1758. He died at Florence on April 8, 1833.

MORHOF, DANIEL GEORG, the learned author of a survey of universal literature entitled *Polyhistor*, was born at Wismar in 1639, studied law at Rostock, and was appointed professor of poetry there in 1660. He died at Lübeck in 1691.

MORIAH. In 2 Chron. iii. 1 we read that Solomon built the Temple at Jerusalem on Mount Moriah (הַר מוֹרְיָה). This name for the Temple hill, the ancient

Zion, is not found elsewhere in the Old Testament, and can hardly have been a current one. But a mountain in the "land of Moriah" was the place where Abraham was commanded to sacrifice Isaac; Josephus (*Ant.*, i. 13, 2) assumes that this *Μωρϊον ὄρος* was the Temple hill, and the same view is expressed in the Targums.

MORIER, JAMES, English traveler and author, was born in 1780 and died at Brighton, March 23, 1849.

MORILLON, a name commonly given by fowlers to the female or immature male of the GOLDEN EYE, the *Clangula glaucion* of modern ornithology.

MORIN, JEAN, or, in Latin, JOANNES MORINUS, the most learned Catholic theologian of his time and one of the founders of Biblical criticism, was born in 1591 at Blois. His pen sometimes brought him into trouble. The *Histoire de la délivrance de l'Église Chrétienne par l'emp. Constantin, et de la grandeur et souveraineté temporelle donnée à l'Église Romaine par les rois de France* (1630) gave great offense at Rome, and a *Déclaration* (1654), directed against faults in the administration of the Oratory and reflecting on the general (Father Bourgoing), was strictly suppressed. So, too, his great work on penance gave equal offence to the Jesuits and to Port Royal, and even after his death (1659) Protestants long treated his valuable contributions to the history of the Hebrew text as a mere utterance of Popish prejudice.

MORLAIX, the chief town of an arrondissement in the department of Finistère, France, lies 350 miles west of Paris on the railway from Paris to Brest, and at the confluence of two small streams, seven miles distant from the sea.

MORLAND, GEORGE, animal and subject painter, was born in London June 26, 1763. The finest of Morland's subjects date from 1790 to 1792. He was arrested for debt, and died in a sponging house in Eyre street, Coldbath Fields, October 29, 1804. His wife survived him only some three days, and they were buried in one grave.

MORMONS, or LATTER-DAY SAINTS.—Such are the names borne by the followers of Joseph Smith, the founder of a religion now numbering throughout the world about four hundred thousand adherents, with their headquarters at Salt Lake City, Utah. The Mormon Prophet was a native of Sharon, Windsor County, Vermont, where he was born December 23, 1805. His ancestry was Anglo-American, and his parentage of the ordinary New England farming folk. He was but a boy of fourteen, living with his parents, Joseph and Lucy Smith, at Manchester, now in Wayne County, New York, when he began the remarkable career which resulted in the establishment of the faith commonly called Mormonism, claimed by its disciples to be the pure Gospel of Jesus Christ, restored to earth through heavenly ministrations, after the lapse of ages. Joseph Smith, Jun.'s account of his early experiences may be summarized as follows:

In the midst of a religious revival greatly agitating the rural neighborhood in which he lived, and which caused members of his father's family to unite themselves, some with one sect, some with another, he sought divine guidance, that he might know which of all the contending churches was the true Church of Christ. In answer to his prayer, the Father and the Son, two of the Holy Trinity, he holds, appeared to him in vision, forbade him to join any of the churches then existing, and told him that the true Church, with all its primitive gifts

and powers, was about to be re-established among men, prior to the second coming of the Son of God and the consummation of all things predicted by the holy prophets. Subsequently, he relates, he was visited by angelic messengers, one of whom proclaimed himself to be Moroni, the last of a line of prophets who in mortality had ministered to an ancient people named Nephites, a branch of the house of Israel, which from 600 B. C. to 420 A. D. inhabited the American continent, and were destroyed by an apostate faction of their people called Lamanites, ancestors of the present Indians. Their history, as abridged by Mormon, Moroni's prophet sire, and engraven upon golden plates, would be found, the angel said, in a hill anciently known as Cumorah, near to Manchester. With the plates was an instrument called the Urim and Thummim, by means of which the engraved hieroglyphics could be translated. These plates, containing among other things an account of the Saviour's personal ministry to, and the organization of his Church among, the Nephites, after his death and resurrection at Jerusalem, Joseph Smith claimed to have received and translated, the result of which was the appearance of the Book of Mormon, believers in which were dubbed "Mormons." While Joseph Smith, assisted by Oliver Cowdery, was engaged in translating the Nephite record, an angel, calling himself John the Baptist, appeared and ordained them to the Aaronic priesthood, which gave them authority to preach faith and repentance and to baptize by immersion in water for the remission of sins. Soon afterwards, three other heavenly messengers, the Apostles Peter, James, and John, ordained them to the Melchisedek priesthood, which empowered them to confirm their converts by the laying on of hands for the bestowal of the Holy Ghost, and to do all other things necessary to be done in the opening of the new Gospel dispensation.

Joseph Smith, with Oliver Cowdery and four others, organized the Church of Jesus Christ of Latter-day Saints, at Fayette, Seneca County, New York, April 6, 1830. Less than a year later the Church, whose exclusive claims, rapid increase, and spiritual manifestations aroused the active and united opposition of the other religious bodies, moved to Kirtland, Ohio, where a Temple was built and the standard raised for the gathering of scattered Israel from the nations. In the summer of 1831 a Mormon colony was planted in Jackson County, Missouri, where the Saints, according to the word of their Prophet, were yet to assemble *en masse*, to "build up Zion," the New Jerusalem, and prepare for the advent of the Messiah. To that end the foundations of a city and a temple were laid at Independence, but in the autumn of 1833, the older settlers of Jackson County, putting their own construction upon the motives and acts of the newcomers, charging them among other things with being Abolitionists, arose in armed force and drove them from the county. They were not permitted to return, and were never reimbursed for their lands and improvements. The Church, it is said, still expects, however, to possess and inhabit Jackson County, "the land of Zion"; other places occupied by it being but "stakes of Zion."

In 1837-38, the main body of the Mormon people settled in Caldwell County, Missouri, and adjacent parts, but again trouble pursued them, through political and religious differences with their neighbors, and in the depth of winter, under an order of Governor Lilburn W. Boggs, enforced by the militia of the State, they were expelled with fire and sword from its confines. Hospitably

received in Illinois, they built their beautiful city of Nauvoo, in Hancock County, on the banks of the Mississippi. Here another Temple was erected, and the work of "the gathering" resumed, converts now flocking from all parts of the Union, and, from the Canadian Provinces, as well as from Great Britain. At Preston, Lancashire, England, the first foreign baptisms took place, in July, 1837. In 1840, another mission in that land was built broadly upon the foundations thus laid. The first Mormon immigrants from Europe arrived at Nauvoo in July of that year (1840).

In June, 1844, Joseph Smith and his brother Hyrum were murdered by a mob in Carthage jail, after surrendering themselves for trial upon certain charges brought against them by their enemies. This affair gave a great impetus to the Church, and brought Brigham Young to the front as the Prophet's successor. Under his leadership, in February, 1846, the main body of the Mormon community began their famous exodus into the wilderness, seeking some spot where they could live in peace and enjoy their religion unmolested. Halting long enough upon the Missouri River frontier more thoroughly to organize themselves, and incidentally to fill a requisition from the Government for a battalion of five hundred picked men to assist in the war against Mexico, the migrating Saints pushed on westward, preceded by Brigham Young and a small band of pioneers, who, crossing the then barren plains and bleak mountains, penetrated in July, 1847, to the heart of the Great American Desert, where they founded Salt Lake City, the first of many Mormon towns and villages that have since sprung up and redeemed to civilization the once sterile waste.

Brigham Young, the founder of Utah, and America's greatest colonizer, died at Salt Lake City, August 29, 1877. He was succeeded at the head of the Church by John Taylor, and subsequently by Wilford Woodruff and Lorenzo Snow. Joseph F. Smith, the present leader, is a son of Hyrum Smith, and the name-sake and nephew of the Prophet. Under these several administrations Mormonism has been preached in many lands, and the Book of Mormon has been translated and published in thirteen different languages. The Church at present (1902) has fourteen foreign missions, comprising most of the countries of the globe, and keeps in the mission-field about two thousand missionaries. The latest mission opened was that of Japan. Most of the proselytes to the faith,—gathered chiefly from American and European countries,—are to be found in the "stakes of Zion," about fifty in number, extending through the Rocky Mountain region from Canada to Mexico. A "stake" is an organized sub-division of the Church, usually synonymous, in a territorial sense, with County. Each "stake" is divided into "wards."

The Mormon Church organization is claimed to be the most perfect in existence. Chief in authority are the First Presidency, or the President and his two Counsellors, who preside over the Church throughout the world. Next are the Twelve Apostles, whose special mission is to preach the Gospel, and regulate the affairs of the Church, under the direction of the First Presidency. Then comes the Presiding Patriarch, whose prerogative it is to bestow blessings upon the people. The next grade is the First Seven Presidents of Seventies, presiding over a great body of Priesthood, whose members are assistants to the Twelve Apostles. Last among the General Authorities is a Presiding Bishopric of three, who minister in temporal things, receiving and disbursing the tithes of the Church, as directed by the

First Presidency. Over each "stake" is a Presidency of three and a High Council of twelve, and in each "stake" are quorums of High Priests, Seventies, and Elders. Each "ward" has a bishopric of three, under whom are quorums of Priests, Teachers, and Deacons. The Bishops' courts and High Councils are the Church tribunals, the former exercising original, and the latter both original and appellate, jurisdiction. The extreme penalty inflicted by either is excommunication. The auxiliary organizations comprise Relief Societies, Mutual Improvement Associations, Primary Associations, Church Universities, Colleges and Academies, Sabbath schools, and religion classes. Among the chief buildings erected by the Mormon Church are the Salt Lake, Logan, Manti, and St. George Temples, and the Salt Lake Tabernacle. The temples are for the performance of sacred rites and ordinances, and are not open to the public; the Tabernacle, which has a seating capacity of eight thousand and contains one of the finest organs in the world, is for regular Sunday services, and is open and free to all.

The Articles of Faith of the Church of Jesus Christ of Latter-day Saints, as formulated by its first Prophet and President, are as follows:

1. We believe in God, the Eternal Father, and in His Son Jesus Christ, and in the Holy Ghost.
2. We believe that men will be punished for their own sins, and not for Adam's transgression.
3. We believe that through the atonement of Christ all men may be saved, by obedience to the laws and ordinances of the Gospel.
4. We believe that these ordinances are: First, faith in the Lord Jesus Christ; second, repentance; third, baptism by immersion for the remission of sins; fourth, laying on of hands for the gift of the Holy Ghost.
5. We believe that a man must be called of God by "prophecy, and by the laying on of hands," by those who are in authority, to preach the Gospel and administer in the ordinances thereof.
6. We believe in the same organization that existed in the primitive church, viz: apostles, prophets, pastors, teachers, evangelists, etc.
7. We believe in the gift of tongues, prophecy, revelation, visions, healing, interpretation of tongues, etc.
8. We believe the Bible to be the word of God, as far as it is translated correctly; we also believe the Book of Mormon to be the word of God.
9. We believe all that God has revealed, all that He does now reveal, and we believe that He will yet reveal many great and important things pertaining to the kingdom of God.
10. We believe in the literal gathering of Israel, and in the restoration of the Ten Tribes; also that Zion will be built upon this continent; that Christ will reign personally upon the earth, and that the earth will be renewed and receive its paradisaic glory.
11. We claim the privilege of worshipping Almighty God according to the dictates of our conscience, and allow all men the same privilege, let them worship how, where, or what they may.
12. We believe in being subject to kings, presidents, rulers and magistrates, in obeying, honoring, and sustaining the law.

13. We believe in being honest, true, chaste, benevolent, virtuous, and in doing good to all men; indeed, we may say that we follow the admonition of Paul, "We believe all things, we hope all things," we have endured many things, and hope to be able to endure all things. If there is anything virtuous, lovely, or of good report or praiseworthy, we seek after these things.

For many years, dating from July, 1843, the Church authorized the practice, as a religious principle, and under strict regulations, of Patriarchal or plural marriage, commonly called "polygamy"; but only about two per cent of the Latter-day Saints have lived in that relation. In September, 1890, President Wilford Woodruff issued a manifesto, calling upon his people to cease this practice, and submit to the laws enacted by Congress against it. The Manifesto was unanimously accepted by the Saints in general conference. Since that event, and the changed conditions that have followed, a far more friendly feeling than once existed has prevailed between the two classes known as "Mormons" and "Gentiles."

ANTHON H. LUND,

Historian Church of Jesus Christ of Latter-day Saints.

MORNAY, PHILIPPE DE, Seigneur du Plessis-Marly, very generally known as Mornay Du Plessis or Du Plessis-Mornay, one of the most distinguished members of the Protestant party in France, was born at Buhy in Normandy on November 5, 1549, and died in 1623.

MORNY, CHARLES AUGUSTE LOUIS JOSEPH, DUC DE, was the natural son of Hortense Beauharnais, queen of Holland, and of the comte de Flahaut, a leading dandy of the period, and was thus brother to Napoleon III. The secret of his birth (October 23, 1811) was carefully kept; he was acknowledged as son by the comte de Morny for a consideration, and was brought up by his paternal grandmother, Madame de Souza, a writer of society novels, and a woman of great wit and high breeding.

Morny was, on the day of the *coup d'état*, made minister of the interior, but he had no taste for the drudgery of administration, and, in January, 1852, found an excuse for resigning on the question of the property of the Orleanist princes. The empire established, he was able to begin speculating, and used both the money of the state and his influence with his brother for the success of his schemes. He had been in 1852 reelected deputy for Clermont-Ferrand, and was in 1854 elected president of the corps législatif, an office which he held the rest of his life.

In 1856 he was special ambassador at the coronation of Czar Alexander II., when he spent immense sums, and married a wealthy Russian, Princess Troubetzkoy. In 1862 he was created a duke, and in 1865, after continuing to the last his career of dissipation, died of sheer anæmia from the measures he took to keep himself fit for yet further excesses.

MORO, ANTONI, otherwise known as SIR ANTHONY MORE, an eminent portrait-painter, was born at Utrecht, in 1512 according to some, but in 1525 according to Van Mander. His death took place at Antwerp about 1581.

MOROCCO, or MAROCCO, the term (corrupted from the name of the city Marrákush) used in English to designate the Maghrib al-Aksá or extreme west of the Arabs, is the country at the northwestern corner of the African continent, with the Mediterranean on the north and the Atlantic on the west. Its landward limits can

only be vaguely defined. The eastern frontier toward Algeria, determined by the treaty of 1844, is a purely conventional line starting from the mouth of a small stream called the Skis and running across country in a general south-southeast direction. The southern boundaries expand and contract according to the power and activity of the central authorities. Behm and Wagner (1882), who include Táfillet, Kenatsa, Figig, Twat, Gurara, Tidikelt, the plateau of Tedmaid, etc., estimate the total area of the sultanate at 305,548 square miles; and this, which is about twice the size of Algeria, or five times that of England and Wales, may be taken as a maximum. The allegiance of many of the tribes within this compass is questionable and intermittent. Morocco is still the portion of Northern Africa about which European information is most defective, and the ordinary maps are composed to a large extent of most unscientific material eked out by probabilities and conjecture. Since the middle of the present century a good deal has been done in the way of exploration, mainly in the low lands and steppes sloping toward the Atlantic, the country of the great historical cities of Tangiers, Fez, Meknes (Mequinez), and Morocco; but even there what lies but a few miles east or west of some track traversed by Europeans for centuries remains matter of question.

Since the publication of Arlett's survey from Cape Spartel to Cape Bojador (1840-44) and of Vincendon-Dumoulin and Kerhallet's surveys from the Strait of Gibraltar to the Algerian frontier (1853-57) the seaward aspect of Morocco has been known in detail. To the Mediterranean it presents for a distance of about 200 miles the rugged profile of the Rif hills (still unexplored), which generally end in lines of cliff broken at intervals by narrow sweeps of sandy beach, but occasionally open up into beautiful and fertile valleys, with abundant evidence of human occupancy and tillage. About six miles west of the Skis lies the mouth of the great river Mulúya; and ten miles farther on, opposite Cape del Agua (Ras Sidi Beshir), is a group of dry and barren islands known as the Zafarines, which form the best roadstead on the Rif coast. Between Point Quiviana and Melilla runs a low and sandy shore in front of a great salt marsh, the Puerto Nuevo of the Spaniards. Melilla (Malíla) is a fortified town, held by the Spaniards since 1653, built on a rocky peninsula and connected by lines of rampart with Fort Rosario on the heights behind. Near the village of Azanen is a wide open shore with the only sand-dunes on all this coast. The fine semicircular bay of Alhucemas is the seaward end of one of the most beautiful valleys in the Rif, clothed with verdure and dotted with hamlets. A Spanish *presidio* occupies one of the larger of the Alhucemas islands (Al-Mazemma), which are identified with the Ad Sex Insulas of the itineraries. Another Spanish fortress crowns the rocky island of San Antonio or Peñon de Velez; and in the valley off which it lies stood a town known to the Spaniards as Velez de Gomera, to the Arabs as Bádís, which continued to be a place of importance in the sixteenth century. The so-called Bay of Tetuan—the town is just visible from the sea—is little more than the straight stretch of coast between Cape Mazari on the south and Cape Negro or Negrete on the north; but the prominence of these two headlands gives it an appearance of depth. From Cape Negro northward to Ceuta the most notable object on the horizon is the summit of Jebel Músá, which, though situated on the Strait of Gibraltar, towers above the intervening hills. Ceuta (Sebta), the most important and flourishing of the Spanish settlements in Morocco, occupies a peninsula—the head, Mt. Acho, standing about four miles out to sea, and the neck being low and

narrow. It marks the eastern end of the strait. Westward, the first point of interest is again Jebel Músá, the Elephas of Strabo, and the Ape's Hill of English charts; the truncated top is usually hid in clouds. About twenty miles farther along the coast lies the Bay of Tangiers, by far the finest harbor in Morocco. West from Tangiers runs the Jebel Kebír (880 feet at its highest), the seaward extremity of which forms the celebrated Cape Spartel, the northwest angle of the African continent, known to the ancients as Ampelusius or Cotes Promontorium. The lighthouse, built in 1864, at the cost of the sultan of Morocco, and maintained at the joint expense of England, France, Italy, and Spain, is the only one on the western coast.

The present state of Morocco is deplorable. The government is an Oriental despotism under an independent quasi-hereditary sultan; there are no administrative functionaries with definite responsibility and regular salary; the distribution of justice is utterly arbitrary, and the punishments often barbarous in the extreme; education, in the European sense of the word, there is none; foreign commerce is hampered by vexatious prohibitions and restrictions, internal trade by the almost complete absence of roads and bridges, and by the generally lawless state of the country (the very peasant has his gun beside him as he plows); the only substitute for a postal system is a class of running couriers; and even the army (in which the sultan does take an interest) is only just beginning to show signs of discipline and effectiveness under the supervision of Káid M'Clean and other foreign officers. The last remnants of the once powerful Moorish fleet are rotting beyond recognition in the harbor of Larash. With good government and freedom of trade the country might soon be restored to a high state of prosperity; its climate, soil, products, and the qualities of its predominant population are full of promise; and the evident decrease of hostility toward the Christian, which may be observed since the beginning of the century, and especially within recent years, gives hope that European influence, apart from European conquest, may before long remove from Morocco the reproach of being "the China of the West," the most backward and barbarous of civilized nations.

MOROCCO, or MAROCCO (Marrákush), one of the quasi-capitals of the sultanate (Fez and Meknes being the other two), lies in a spacious plain about fifteen miles from the northern underfalls of the Atlas, and ninety miles east-southeast of Safí. Ranking during the early centuries of its existence as one of the greatest and most flourishing cities of Islam, Morocco has long been in a state of grievous decay; and were it not for the exceptional beauty of its situation, the luxuriant groves and gardens by which it is encompassed and interspersed, and the magnificent outlook which it enjoys toward the mountains, it would be altogether a very miserable place.

MORON, or MORON DE LA FRONTERA, a town of Spain, in the province of Seville, about thirty-two miles to the southeast of that city, occupies an irregular site upon broken chalk hillocks at a distance of a mile and a half from the right bank of the Guadaira. It is connected by rail with Utrera on the Cadiz and Seville line. The population of the town is 15,000.

MORONI, GIAMBATTISTA, an eminent portrait-painter of the Venetian school, was born at Albino near Bergamo about 1510. Moroni was engaged upon a *Last Judgment* in the church of Corlago when he died on February 5, 1578.

MOROSINI, the name of a noble Venetian family. The most distinguished member of the house of Morosini was Francesco, the captain-general of the republic against the Turks and conqueror of the Morea. He

was born in 1615. In 1666 he was in command during an unfortunate campaign in Candia. In 1687 he conquered Patras, and so opened the Morea to the Venetian arms. In the following year he was elected doge. After his return to Venice the republic suffered severely in Candia, and though now an old man Francesco took the field again in 1693, but died the next year at Nauplia, seventy-six years of age.

MORPETH, a municipal and parliamentary borough of Northumberland, England, is situated in a fine valley on the Wansbeck, and on the Northeastern Railway, fifty miles south of Berwick and sixteen north of Newcastle.

MORPHEUS is a personification, apparently invented by Ovid, of the power that calls up shapes before the fancy of a dreamer. Morpheus is naturally represented as the son of Sleep (Somnus).

MORPHIA. See OPIUM.

MORPHOLOGY. The term Morphology, introduced by Goethe to denote the study of the unity of type in organic form (for which the Linnæan term METAMORPHOSIS (*q.v.*) had formerly been employed), now usually covers the entire science of organic form.

If we disregard such vague likenesses as those expressed in the popular classifications of plants by size into herbs, shrubs, and trees, or of terrestrial animals by habit into beasts and creeping things, the history of morphology commences with Aristotle. Founder of comparative anatomy and taxonomy, he established eight great divisions (to which are appended certain minor groups)—*Viviparous Quadrupeds, Birds, Oviparous Quadrupeds and Apoda, Fishes, Malakia, Malacostraka, Entoma, and Ostracodermata*—distinguishing the first four groups as *Enaima* ("with blood") from the remaining four as *Anaima* ("bloodless"). In these two divisions we recognize the Vertebrata and Invertebrata of Lamarck, while the eight groups are identical with the Mammals, Birds, Reptiles, Fishes, the Cephalopods, Crustaceans, other Articulates, and Testaceans of recent zoölogy. Far, too, from committing the mistake often attributed to him of reckoning Bats as Birds, or Cetaceans as Fishes, he discerned the true affinities of both, and erected the latter into a special genus beside the Viviparous Quadrupeds, far more on account of their absence of limbs than of their aquatic habits. Not only is his method inductive, and, as in modern systems, his groups natural, *i.e.*, founded on the aggregate of known characters, but he foreshadows such generalizations as those of the correlation of organs, and of the progress of development from a general to a special form, long afterward established by Cuvier and Von Baer respectively. In the correspondence he suggests between the scales of Fishes and the feathers of Birds, or at that hinted at between the fins of Fishes and the limbs of Quadrupeds, the idea of homology too is nascent; and from the compilation of his disciple Nicolaus of Damascus, who regards leaves as imperfectly-developed fruits, he seems almost to have anticipated the idea of the metamorphosis of plants. In short, we find a knowledge of structural facts and a comparative freedom from the errors induced by physiological resemblance, of which his successors such as Theophrastus and Pliny, generally mere classifiers by habit, show little trace, and which the moderns have but slowly regained. Little indeed can be recorded until the thirteenth century, when the reappearance of Aristotle's works gave a new impulse to the study of organic nature. Of the works of this period that of Albertus Magnus is far the most important; but they are all no more than revivals of Aristotle, marking the reappearance of scientific method and the reawakening of interest in and sympathy with

nature. Meanwhile leech and apothecary, alchemist and witch, were accumulating considerable knowledge of plants, which, after the invention of printing, became collected and extended in the descriptive and well-illustrated folios of Gessner and his successors Fuchs, Lobel, and others, as well as by the establishment of botanic gardens and scientific academies, while as Sachs expresses it, "in the sharpest contrast to the naive empiricism of the German fathers of botany came their Italian contemporary Cæsalpinus, as the thinker of the vegetable world." Both made systematic efforts—the Germans vaguely seeking for natural affinities in mere similarities of habit, the Italian with no inconsiderable success striving toward an intellectual basis of classification. Monographs on groups of plants and animals frequently appeared, those of Belon on Birds and Rondelet on Fishes being among the earliest; and in the former of these (1555) we find a comparison of the skeletons of bird and man in the same posture and as nearly as possible bone for bone—an idea which, despite the contemporaneous renaissance of human anatomy initiated by Vesalius, disappeared for centuries unappreciated save by the surgeon Ambroise Paré. Palissy, like Leonardo before him, discerned the true nature of fossils; and such flashes of morphological insight continued to appear from time to time during the seventeenth century.

The encyclopædic period of which Gesner is the highest representative was continued by Aldrovandi, Jonston, and others in the seventeenth century, but, aided powerfully by the Baconian movement, then profoundly influencing all scientific minds, it developed rapidly into one of genuinely systematic aim. At this stage of progress by far the most important part was taken by John Ray, whose classificatory labors both among plants and animals were crowned with marvelous success. He first definitely expelled the fabulous monsters and prodigies of which the encyclopædists had faithfully handed on the tradition from mediæval times, and, like his predecessor, Morison, classifying in a truly modern spirit by anatomical characters, he succeeded, particularly among plants, in distinguishing many natural groups, for which his very terms sometimes survive, *e.g.*, Dicotyledons and Monocotyledons; Umbelliferae and Leguminosæ. The true precursor of Linnaeus, he introduced the idea of *species* in natural history, afterward to become so rigid, and reformed the practice of definition and terminology. Of the many works which followed up Ray's systematic and monographic labors, though often, like those of Tournefort and Rivinus, Réaumur and Klein, of great importance, none can be even named until we come to those of his great successor, Linnaeus, whose extraordinary grasp of logical method and unparalleled lucidity of thought and expression enabled him to reform and reorganize the whole labors of his predecessors into a compact and definite "systema naturæ." The very genius of order, he established modern taxonomy (see BIOLOGY), not only by the introduction of the binomial nomenclature and the renovation of descriptive terminology and method, but by the subordination of the species, henceforth clearly defined, and the successive higher categories of genus, order, and class, so finally reconciling the analytic and synthetic tendencies of his predecessors.

While the artificial system was at the zenith of its fame and usefulness, Bernard de Jussieu was arranging his garden on the lines afforded by the fragmentary natural system of Linnaeus. His ideas were elaborated by his nephew and successor Antoine de Jussieu, who for the first time published diagnoses of the natural orders, so giving the system its modern character.

The labors of Bernard and Antoine de Jussieu initi-

ated to a vast parallel advance in zoölogy, the joint memoir on the classification of mammals with which Cuvier and Geoffroy St.-Hilaire almost commenced their career receiving its dominant impulse from the "genera" of Antoine. Cuvier's works correspond in zoölogy to those of the whole period from the Jussieu's to Brown, and epitomize the results of that line of advance. Although in some respects preceded by Haller and Hunter, who compared, though mainly with physiological aim, the same parts in different organisms, and much more distinctly by Vicq d'Azyr, the only real comparative anatomist of the eighteenth century, he truly opens the era of detailed anatomical research united with exact comparison and clear generalization. The *Règne Animal* (1817) and the theory of types (vertebrate, molluscan, articulate, and radiate) are the results of this union of analysis and synthesis (although he himself, exasperated by the aberrations of the Naturphilosophie, was accustomed to proclaim the importance of detailed empiricism alone), and mark the reconstitution of taxonomy on a new basis, henceforth to be no longer a matter of superficial description and nomenclature but a complete expression of structural resemblances and differences. More even than Linnæus he is the founder of a great school, whose names and labors are imperishable. In Germany, Bojanus, Meckel, Von Siebold, and the illustrious Johannes Müller, with his many living pupils, have carried on the work; in France, too, a succession of brilliant anatomists, such as De Quatrefages, Milne-Edwards, and Lacaze-Duthiers, are his intellectual heirs; and in England he has been admirably represented by Owen.

The term *morphology* was first introduced by Goethe in 1817, in a subsequent essay. It did not come into use in botany until its popularization by Auguste de St.-Hilaire in his admirable *Morphologie Végétale* (1841), and in zoölogy until later, although De Blainville, who also first employed the term *type*, had treated the external forms of animals under "morphologie." Though the Naturphilosophie of Schelling and its countless modifications by his followers, its mystic theories of "polarization" and the like, its apparatus of assumption and abstraction, hypothesis and metaphor, cannot here be discussed, its undoubted services must not be forgotten, since it not only stimulated innumerable reflective minds to the earnest study of natural science, but, by its incessant proclamation of the unity of nature and the free use of Platonic archetypes gave a most powerful impulse to the study of comparative anatomy, and nobly vindicated the claims of philosophic synthesis over those of merely analytic empiricism. Among its many adherents, some are of more distinctly theological type, others metaphysical, others mystical or poetic, others, again, more especially scientific; but its most typical and picturesque figure is Lorenz Oken, who epitomizes alike the best and the worst features of the school; and among whose innumerable pseudo-morphological dreams there occasionally occurred suggestions of the greatest fruitfulness—notably, for instance, the independent statement of the vertebral theory of the skull.

Strict classification of forms supposed constant excludes any *natural* relationship. The type theory, the theory of unity of organic composition, and the like, are susceptible indeed of two explanations; they may be either regarded as expressing a creative plan, or taken as purely Platonic and archetypal ideas. Both are tenable on theological and metaphysical grounds respectively, but the fact must not be disguised that of this unity of type no explanation in the least degree scientific, *i.e.*, in terms of the phenomena of the natural world, does or can exist. The needful solution was effected by Darwin. The "urpflanze" of Goethe, the types of Cuvier, and

the like, at once became intelligible as schematic representations of ancestral organisms, which, in various and varying environments, have undergone differentiation into the vast multitude of existing forms. All the enigmas of structure become resolved; "representative" and "aberrant," "progressive" and "degraded," "synthetic" and "isolated," "persistent" and "prophetic" types no longer baffle comprehension; conformity to type represented by differentiated or rudimentary organs in one organism is no longer contradicted by their entire disappearance in its near allies, while systematist and morphologist become related simply as specialist and generalizer, all through this escape from the Linnaean dogma of the fixity of species. The phenomena of individual development receive interpretation in terms of ancestral history; and embryology thus becomes divided into ontogeny and phylogeny, the latter, too, coming into intimate relation with paleontology, while classification seeks henceforth the reconstruction of the genealogical tree. All these results were clearly developed in the most important work of the new period, Haeckel's *Generelle Morphologie* (1866), while the valuable contemporaneous *Principles of Biology* of Herbert Spencer also gave special attention to the relation of morphology to physiology.

MORRIS, ROBERT, American statesman, was born at Liverpool, England, on January 20, 1734. At the age of thirteen he accompanied his father to America, and after serving in a counting-house at Philadelphia he became in 1754 partner in the business. From 1776 to 1778 he was delegate to the Continental Congress, and he was one of those who signed the Declaration of Independence. During the war he served on the committee of ways and means, and freely placed his immense wealth at the disposal of his country, his personal credit being at one time pledged to the amount of \$1,400,000. He also in 1780 established the bank of North America, and until 1784 acted as superintendent of finance. In 1786 he became a member of the Pennsylvania legislature, and he was one of the convention which framed the Federal constitution in 1787. From 1786 to 1795 he was United States senator. On account of the disastrous result of some of his financial speculations Morris passed the later years of his life in a debt prison. He died at Philadelphia, May 8, 1806. Robert Morris had as his assistant-superintendent of finance Gouverneur Morris (1752-1816), with whom he engaged also in several mercantile enterprises. Gouverneur Morris, who rose to some eminence as a statesman and orator, was more fortunate in his speculations than his colleague, and latterly became celebrated for the munificence of his hospitality. He was the author of a series of essays on currency and finance.

MORRIS-DANCE, or MORRICE-DANCE, a performance for a long time associated with certain festive seasons in England, but now wholly discontinued.

MORRISON, ROBERT, the first Protestant missionary to China, was born of Scottish parents at Morpeth, Northumberland, on January 5, 1782. He died at Canton on August 1, 1834. His *Memoirs*, compiled by his widow, were published in 1839.

MORRISTOWN, a city of the United States, county seat of Morris county, N. J., lies on the Whippany river, thirty-one miles from New York by the Morris and Essex division of the Delaware, Lackawanna, and Western Railroad. It was twice the headquarters of the American army during the War of Independence, and Washington's residence, owned by the Washington Association, assisted by the State, is a half-mile to the east. On Whatnong mountain, three miles distant, stands the State insane asylum, usually called Morristown Asylum, a vast granite build-

ing 1,243 feet long, erected in 1874-1875, and capable of accommodating 1,000 patients. The population in 1900 was 11,267.

MORSE, SAMUEL FINLEY BREESE, artist and inventor, was born at the foot of Breed's Hill, Charlestown, Mass., on April 27, 1791. His father was the Rev. Jedediah Morse, D.D., the author of Morse's *Geography*. At the age of fourteen Samuel Morse entered Yale College; under the instruction of Professors Day and Silliman he received the first impulse toward those electrical studies with which his name is mainly identified. In 1811 Morse, whose tastes during his early years led him more strongly toward art than toward science, became the pupil of Washington Allston, then the greatest of American artists, and accompanied his master to England, where he remained four years. His success at this period was considerable; but on his return to America in 1815 he failed to obtain commissions for historical paintings, and after working on portraits for two years at Charleston, S.C., he removed first to Washington and afterward to Albany, finally settling in New York. In 1825 he laid the foundations of the National Academy of Design, and was elected its first president, an office which he filled until 1845. The year 1827 marks the revival of Morse's interest in electricity. It was at that time that he learned from Prof. J. F. Dana of Columbia College the elementary facts of electromagnetism. As yet, however, he was devoted to his art, and in 1829 he again went to Europe to study the old masters.

The year of his return, 1832, may be said to close the period of his artistic, and to open that of his scientific life. On board the packet-ship *Sully*, which sailed from Havre October 1, 1832, while discussing one day with his fellow-passengers the properties of the electromagnet, he was led to remark: "If the presence of electricity can be made visible in any part of the circuit, I see no reason why intelligence may not be transmitted by electricity." It was not a novel proposition, but the process of formulating it started in his mind a train of new and momentous ideas. The current of electricity, he knew, would pass instantaneously any distance along a wire; and if it were interrupted a spark would appear. It now occurred to him that the spark might represent a part of speech, either a letter or a number; the absence of the spark, another part; and the duration of its absence, or of the spark itself, a third, so that an alphabet might be easily formed, and words indicated. In a few days he had completed rough drafts of the necessary apparatus, which he displayed to his fellow-passengers. During the twelve years that followed Morse was engaged in a painful struggle to perfect his invention and secure for it a proper presentation to the public. The refusal of the government to commission him to paint one of the great historical pictures in the rotunda of the Capitol seemed to destroy all his old artistic ambition. In poverty he pursued his new enterprise, making his own models, molds, and castings, denying himself the common necessities of life and encountering embarrassments and delays of the most disheartening kind. It was not until 1836 that he completed any apparatus that would work, his original idea having been supplemented by his discovery in 1835 of the "relay," by means of which the electric current might be reinforced or renewed where it became weak through distance from its source.

Finally, on September 2, 1837, the instrument was exhibited to a few friends at his room in the university building, New York, where a circuit of 1,700 feet of copper wire had been set up, with such satisfactory results as to awaken the practical interest of the Messrs. Vail, iron and brass workers in New Jersey, who thence-

forth became associated with Morse in his undertaking. Morse's petition for a patent was dated September 28, 1837, and was soon followed by a petition to Congress for an appropriation to defray the expense of subjecting the telegraph to actual experiment over a length sufficient to establish its feasibility and demonstrate its value. The committee on commerce, to whom the petition was referred, reported favorably. Congress, however, adjourned without making the appropriation, and meanwhile Morse sailed for Europe to take out patents there. The trip was not a success. In England his application was refused on the alleged ground that his invention had been already published; and, while he obtained a patent in France, it was subsequently appropriated by the French government without compensation to himself. His negotiations also with Russia proved futile, and after a year's absence he returned to New York. On February 23, 1843, Congress passed the long-delayed appropriation, steps were at once taken to construct a telegraph from Baltimore to Washington, and on May 24, 1844, it was used for the first time. Morse's patents were already secured to him and his associates, and companies were soon formed for the erection of telegraph lines all over the United States. In the year 1847 Morse was compelled to defend his invention in the courts, and successfully vindicated his claim to be called the original inventor of the electromagnetic recording telegraph. Thenceforward Morse's life was spent in witnessing the growth of his enterprise and in gathering the honors which an appreciative public bestowed upon him. As years went by he received from the various foreign governments their highest distinctions, while in 1858 the representatives of Austria, Belgium, France, the Netherlands, Piedmont, Russia, the Holy See, Sweden, Tuscany, and Turkey appropriated the sum of 400,000 francs in recognition of the use of his instruments in those countries. In the preparations for laying the first Atlantic cable he took an active part, though the attempt of 1857, in which he personally engaged, was not successful. He died April 2, 1872, at New York, where his statue in bronze now stands in the Central Park. His instrument and alphabet are now used on 95 per cent. of the telegraph wires of the world.

MORSHANSK, a district town of Russia, situated in the government of Tamboff, 58 miles (187 miles by rail) to the north of the capital of the province, on the Tsna river, a tributary of the Oka, and on the railway between Moscow and Orenburg. Population, 28,000.

MORTALITY TABLES. See INSURANCE.

MORTGAGE. The general object of mortgage is to secure a money debt by making it a charge on land, so that, if the debt be not paid by a time agreed upon between the parties, the creditor may sell the land and pay himself out of the proceeds. In English law this is done by a conveyance of the land in absolute terms to the creditor, subject only to its being defeated if the debt should be paid at the time fixed; an arrangement to which the law has attached peculiar incidents designed to carry out its real object. An absolute conveyance, however, is by no means essential to the purposes of mortgage.

As to mortgages of personal property see PLEDGE.

In the United States there is great diversity in the extent to which equitable principles have been formally substituted for the rules of the common law in dealing with mortgages. Washburn arranges the States into three "pretty well defined classes." In the first, the mortgage deed is held to create a seizure of and an estate in the premises, with all its common law incidents, to be enforced if need be by ejectment. In the second, the mortgagee's rights are limited to such as the rules of

equity prescribe, and may not be enforced by a suit at law. In the third, the mortgagee's interest is not deemed an *estate* at all, but is here only to be enforced by the sale of the premises as a means of paying the debt. In the first class come Massachusetts, Maine, Connecticut, New Hampshire, Rhode Island, Vermont, Indiana, Missouri, North Carolina, Mississippi, Minnesota; in the second, Iowa, Illinois, Pennsylvania, Kentucky, Ohio, Wisconsin, and Texas; in the third, California, Georgia, and New York, to which may be added Oregon.

MORTIFICATION, a term used in surgery signifying a local death. Any cause which interferes with the blood-supply of a portion of the body will, if sufficiently prolonged or sufficiently severe, give rise to mortification. In some cases the death may be preceded by inflammation; in others, as in old people with diseased vessels, the part may die in consequence simply of insufficient blood-supply without any previous inflammation. The part is said to mortify; the process is termed gangrene; the dead part is called a slough. A severe injury may end in mortification. Extreme heat as in severe burns, or extreme cold as in frost-bite, may give rise to the condition. Those parts of the body farthest from the center of the circulation are most liable to mortification. Frost-bite, for example, may attack the toes or fingers as well as those parts which are most exposed to the cold, more particularly the point of the nose or the ears. The part affected becomes pale, bloodless, cold, and insensible. The great point to attend to is to restore the circulation gradually, using gentle friction. If the person is brought before a fire, or if any hot applications are used, then a rapid reaction may issue in a severe inflammation, which may be followed by mortification. Chilblain is a mild form of frost-bite occurring in young people with sluggish circulations, very often caused by sitting down before a strong fire with cold feet; any one suffering from cold feet or hands should take plenty of exercise, and if after a return from a sharp walk the feet remain cold the heat should be restored by rubbing with a rough towel.

MORTMAIN, STATUTES OF. The object and effect of these enactments are treated in the articles **CHARITY** and **CORPORATION**, (*q.v.*)

MORTON, JAMES DOUGLAS, fourth earl of, regent of Scotland, second son of Sir George Douglas of Pittendrieh, was born at Dalkeith in 1530. He was accused by James Stewart, earl of Arran, of having taken part in the murder of Darnley, the father of the king, and being tried by a jury of sixteen peers, most of whom were his enemies, was condemned to death and beheaded on June 2, 1581.

MORVEAU. See **GUYTON DE MORVEAU**.

MOSAIC is the fitting together of many, generally small, pieces of marble, opaque glass, colored clays, or other substances, so as to form a pattern; the design may be of various degrees of elaboration, from the simplest, almost monochromatic, geometrical pattern to the most elaborate picture, with figure-subjects represented in colors of countless gradations.

The earliest existing specimens of mosaic belong to one of the less important branches of the art—namely, the ornamentation on a small scale of jewelry, ivory thrones, and other furniture, or more rarely of some elaborate architectural ornament. Most of this earliest sort of mosaic resembles in execution what are called *cloisonnée* enamels. In the Louvre and in the British Museum are preserved some very beautiful ivory carvings in low relief, some from Nineveh and others from Egypt, in which figures of deities, ornaments formed of the lotus and papyrus plants, and royal cartouches are enriched by small pieces of glass or lapis-lazuli and

other gem-like stones, which are let into holes made in the ivory. Each minute piece is separated from the next by a thin wall or *cloison* of ivory about as thick as cardboard, which thus forms a white outline, and sets off the brilliance of the colored stones. The favorite pattern in this sort of work for decorating the larger surfaces appears to have been suggested by the feathers on a bird's wing. (See **IVORY**.)

Another, quite different sort of mosaic was known to the Egyptians of the Ptolemaic and Roman periods. This is made entirely of glass, and is extremely minute. The finest known specimen is in the British Museum; it is a small tablet about three-eighths of an inch square, apparently the bezel of a ring, on which is represented the sacred hawk—every feather on the bird's wing being produced with a great number of colors and tints, each quite distinct, and so minute that a strong magnifying glass is required to distinguish its details.

The way in which this wonderful little mosaic was produced is extremely ingenious. Numbers of long sticks of various-colored glass were arranged in such a way that their ends produced the figure of the hawk; other sticks of blue glass were placed all round so as to form the ground. The whole bundle of sticks of glass when looked at endwise now presented the figure of the hawk with a blue background, immensely larger than it afterward became. The bundle was then heated till the sticks melted together, and the whole thick rod, softened by fire, was then drawn out to a greatly diminished thickness. In this process the relative positions of the sticks of colored glass forming the design were not altered. A slice of the rod was then cut off, and its faces polished—the design, much reduced in size, of course being equally visible at both sides of the slice; and thus the microscopic minuteness of the mosaic was produced, with astonishing delicacy and refinement; many slices, each showing the same mosaic, could be cut from the same rod.

The more important use of mosaic has been on a large scale either for pavements or for walls and vaulted ceilings. Mosaic for these purposes has by many writers, both ancient and modern, been divided on various systems into classes; perhaps the simplest classification is the following: I. *For Pavements:* (a) *Tesselated*, in which the design is formed of small cubes, generally of marble, more rarely of glass or clay; (b) *Sectile* formed of larger pieces of marble, shaped and cut so as to fit accurately one with another. II. *For Walls and Vaults:* *Frictile* or *vermiculated*; pieces of opaque glass, in small cubes, arranged so as to form complicated pictures.

Among the Romans the use of mosaic, both of marble and of opaque glass, was very extensive. According to Pliny, they derived this art from the Greeks, but not until the time of the Third Punic War, 146 B.C., while glass mosaics for walls were a recent invention in his time. Many of these have been found at Pompeii; most commonly they are used to decorate niches for fountains or statuettes.

Throughout England, Germany, France, Spain, Asia Minor, and Northern Africa in no way have signs of Roman occupation been left so clearly and in so conspicuous a form as by the numerous large and generally well-preserved mosaic pavements which have at various times been discovered in all these countries. In many cases, long after all traces of the walls of the buildings have disappeared, owing to their being dug up and removed for building purposes, the mosaics still remain to testify of the artistic power and mechanical skill of the Roman colonists.

The *Medieval Mosaics* may be divided into four principal classes: (1) those used to decorate walls and

vaults, made of glass tubes; (2) those for pavements, made of marble, partly in large shaped pieces, and partly in small tesserae; (3) glass in small pieces, either rectangular or triangular, used to enrich marble pulpits, columns, and other architectural features; (4) wood mosaics.

The wall mosaics were, in their origin, purely Byzantine, and appear to date from the beginning of the fifth century. They are made of colored glass, rendered opaque by the addition of oxide of tin.

MOSCHELES, IGNAZ, one of the most refined and accomplished pianists of the present century, was born at Prague, May 30, 1794. He died March 10, 1870.

MOSCHUS, of Syracuse, is one of the Greek bucolic poets; he was a friend of the Alexandrian grammarian Aristarchus, (about 200 B.C.). His chief work is the epitaph of Bion of Smyrna, another of the bucolic poets, who seems to have lived in Sicily. It is probable that the miscellaneous collection of poems which we possess by the three poets Theocritus, Bion, and Moschus was known to Artemidorus in 200 B.C.

MOSCOW, a government of Central Russia, bounded by Tver on the northwest, Vladimir and Ryazan on the east, Tula and Kaluga on the south, and Smolensk on the west, and having an area of 12,858 square miles. The surface is undulating, with broad depressions occupied by the rivers, and varies in elevation from 500 to 850 feet. Moscow is situated in the center of the so-called Moscow coal-basin, which extends into the neighboring governments. The carboniferous formation is covered with Jurassic clays, sandstones, and sands, which yield a good china-clay at Gjeli, copperas, a sandstone much employed for building, and a white sand used for the manufacture of glass. The whole is thickly covered with boulder-clay and alluvial sands.

The government is watered by the Volga, which skirts it for a few miles on its northern boundary, by the navigable Sestra, which brings it in communication with the canals leading to St. Petersburg, by the Oka, and by the Moskva. Large quantities of grain, metals, glassware, skins, and other commodities are shipped up and down the Moskva, while the Myachkovo stone quarries situated on its banks supply the capital with building stone. There are several marshes, mostly in the north, where also, as well as in the northeast, notwithstanding the immense consumption of wood in manufactures and for use in the capital, extensive forests are still found.

The population, 1,581,700 in 1864 numbered 2,433,356 in 1898, one-third being urban. They are nearly all Great-Russians, and belong to the Greek Church, or are nonconformists. The chief centers of trade are Moscow, Kolomna, Serpukhoff, Bogorodsk, Serghievsk, and Pavlovsk. There are 125 fairs. Transport is much facilitated by railways, and by good highroads radiating from the capital. Moscow is divided into thirteen districts, the chief towns with their respective populations being—Moscow (999,469), Bogorodsk (6,600), Bronnitsy (3,500), Ruza (4,000), Kolomna (18,800), Serpukhoff (16,800), Podolsk (11,000), Zvenigorod (7,800), Mojaisk (4,200), Volokolamsk (3,000), Klin (6,700), Dmitroff (7,600), and Vereya (5,500). In addition to these administrative centers may be mentioned Voskresensk (6,000), Serghievsk Posad (27,500), in the neighborhood of the monastery of Troitsa, a rich commercial and industrial town, and Pavlovsk Posad (4,500). Many of the villages are far more important from their industries and trade than the district towns.

MOSCOW (Russian, *moskva*), the second capital of the Russian empire and chief town of the government and district of the same name, on both banks of the river Moskva, a tributary of the Oka, at its confluence

with the rivulet Yauza. The popular idea is that Moscow is built on seven hills, and in fact the city covers several eminences, the altitudes of its different parts varying from 500 to 850 feet above the level of the sea. It is 400 miles from St. Petersburg, 813 from Archangel, 900 from Ufa, 938 from Astrakhan, 933 from Odessa, and 811 from Warsaw. It lies to the north of the most densely-peopled parts of Russia (the "black-earth region"), while the country to the north of it is rather thinly peopled as far as the Volga, and very sparsely beyond that. The space between the middle Oka and the Volga, however, was the very cradle of the Great-Russian nationality (Novgorod and Pskov excluded); and four or five centuries ago Moscow had a quite central position with regard to this.

The present city measures seven miles from north to south, and nine miles from west-southwest to east-northeast, and covers an area of thirty-two square miles (about forty when the suburbs are included). In the center, on the left bank of the Moskva, stands the "Kreml" or Kremlin, occupying the Borovitsky hill, which in the twelfth century was covered by a dense forest. To the east of the Kremlin is the Kitay-Gorod, formerly the Great Posad, the chief center for trade. The Byelyi-Gorod, which was formerly inclosed by a stone wall (whence the name), surrounds the Kremlin and the Kitay-Gorod on the west, north, and northeast. A line of boulevards now occupies the place of its wall, (destroyed in the eighteenth century), and forms a first circle of streets around the center of Moscow. The Kremlin is an old fort of pentagonal (nearly triangular) shape, ninety-eight acres in extent, occupying a hill about 100 feet above the level of the Moskva. It is inclosed by a high stone wall 2,430 yards in length, restored during the present century, and having eighteen towers. Its five gates are surmounted by high towers.

Of the sacred buildings of the Kremlin the most venerated is the Uspensky cathedral. The former church of this name was erected in 1326 by Ivan Kalita, but, on its falling into disrepair, a new one was built on the same place in 1475-1479, by Fioraventi, in the Lombardo-Byzantine style, with Indian cupolas. It was restored in the eighteenth century and in 1813.

The great palace of the emperors, erected in 1849, is a fine building in white stone with a gilded cupola. It contains the *terems*, or rooms erected for the young princes in 1636 (restored in 1836-1849, their former character being maintained), a remarkable memorial of the domestic life of the czars in the seventeenth century. In the treasury of the czars, Granovitaya Palata and Orujeynaya Palata, now public museums, the richest stores connected with old Russian archæology, are found—crowns, thrones, dresses, various articles of household furniture belonging to the czars, Russian and Mongolian arms, carriages, etc.

The four sides of the Senate Square are occupied by buildings of various dates, from the fifteenth century onward. The senate, now the law courts, was erected by Catherine II. Facing it is the arsenal, containing full ammunition for 200,000 men.

The Kitay-Gorod, which covers 121 acres, and has 20,000 inhabitants, is the chief commercial quarter of Moscow. It contains the Gostinoy Dvor, consisting of several stone buildings divided into 1,200 shops, where all kinds of manufactured articles are sold. The "Red Square," 900 yards long, whose stone tribunal was formerly the forum, and afterward the place of execution, separates the Gostinoy Dvor from the Kremlin. At its lower end stands the fantastic Pokrovsky cathedral (usually known as Vasil Blajennyi), which is the wonder of all strangers visiting Moscow, on account of its towers; all differing from each other, and represent-

ing, in their variety of colors, pineapples, melons, and the like. It was built under Ivan the Terrible by an Italian. The exchange, built in 1838 and restored in 1873, is very lively, and its twenty-three "exchange artels" (associations of nearly 2,000 brokers, possessing a capital of more than \$500,000) are worthy of remark. Banks, houses of great commercial firms, streets full of old bookshops carrying on a very large trade, and finally the Tolkuchy rynok, the market of the poorest dealers in old clothes, occupy the Kitay-Gorod, side by side with restaurants of the highest class. In the Kitay-Gorod are also situated the house of the Romanoffs, rebuilt in 1859 in exact conformity with its former shape; a Greek monastery; and the printing-office of the synod, containing about 600 MSS. and 10,000 very old printed books, together with a museum of old typographical implements.

The northern parts of the Byelyi-Gorod are also the center of a lively trade. Here are situated the Okhotnyi Ryad (poultry market), and the narrow streets Tverskaya and Kuznetsky-Most, the rendezvous of the world of fashion. Here also are the theaters. In the southwest of the Byelyi-Gorod, opposite the garden of the Kremlin, stand the university, the public museum, and the military riding school.

The Zemlyanoy-Gorod, which has arisen from villages that surrounded Moscow, exhibits a variety of characters. In the neighborhood of the railway stations it is a busy center of traffic; other parts of it are manufacturing centers, while others—as, for instance, the small quiet streets in the west of the boulevard of Prechistenka, called the old Konushennaya, with their wooden houses and spacious yards—are the true abodes of the families of the old, for the most part decayed, but still proud nobility. The Zamoskvoryechnie, on the right bank of the Moskva, is the abode of the patriarchal merchant families. Each house is surrounded by a yard whose gate is rarely opened, and each house, with its dependencies and gardens, bears the character of a separate estate. Population of the city (1900), 1,035,664. Since the fourteenth century it has been an important commercial city.

MOSELLE. See RHINE.

MOSER, JOHANN JAKOB, jurist, was born at Stuttgart on January 18, 1701. He died in 1785.

MOSES. Of the life of Moses we have few certain details, though the history of Israel bears witness to the importance of his work. To what has been said under ISRAEL there will here be added a brief summary of what has been handed down about him. His origin and the history of his childhood can be read in Exod. i., ii.; the statements there given are enlarged and modified in the Jewish Midrash, particularly as we find it in Josephus and Philo. The daughter of Pharaoh, we are told, was called Thermutis or Merris; she named the boy Moyses, not because she used the Hebrew verb *Moshē* to express the fact that he was drawn out of the water, but because the Egyptian word for water was *mo*, and *yses* applies to those who have been delivered from it. She took care to have him trained in all the wisdom of the Egyptians and in that of the Greeks, Assyrians, and Chaldeans as well. To his great intellectual endowments corresponded his personal beauty, of which Josephus speaks in extravagant terms. It was on account of his beauty that, when on one occasion, as a young man, he led an Egyptian army against Meroe, the Ethiopian princess Tharbis opened the gates of the capital to him in order to make him her husband.

For reasons explained in Exod. ii. 11 sq., Moses left the land of Pharaoh and came to Midian to the Kenite priest Jethro (also called Hobab Ben Raguel and Rag-

uel), whose daughter Zipporah he married, becoming by her the father of two sons, Gershom and Eliezer. During his stay in Midian he received, at the foot of Sinai (Horeb), the divine revelation at the burning bush whereby he was called to become the liberator of Israel from Egyptian bondage. With much reluctance he at last accepted this vocation, and, already expected by his brother Aaron and the elders, returned to his people. Arrived in Egypt, he associated Aaron with him as his interpreter, being himself no orator, but a man of counsel and action, and appeared before Pharaoh to demand of the king in Jehovah's name permission for the people to go with flocks and herds into the wilderness to celebrate there a festival (the spring festival of the Passover) in honor of their God. Jehovah gave emphasis to the demand by great signs and wonders—the plagues of Egypt, which have their explanation for the most part in evils to which Egypt is periodically liable, but are treated by Israelite tradition as the weapons of Jehovah in his ever-intensifying conflict with the king and the gods of Egypt. At length, by the slaying of the first-born, the stubbornness of Pharaoh was broken, so that he consented to, and even urged, the departure of the Hebrews. By and by, however, he changed his mind, and, setting out in pursuit of the Hebrews, overtook them at the Red Sea; but Jehovah fought for them, and annihilated Pharaoh's chariots and all his host.

By the miracle wrought at the Red Sea Moses was pointed out to the Hebrews as the man of God, to whom accordingly they now committed the task of caring for their outward life as well as their spiritual guidance. He led them first to Sinai, where the law was revealed and the worship in connection with the ark of the covenant instituted. When he had communed face to face with the Godhead for forty days on the holy mountain, the skin of his face shone so that he had to wear a veil (hence the horns, properly rays, on his forehead). Driven from Sinai in consequence of their worship of the golden calf, the Israelites removed to Kadesh with the view of entering Palestine. But this plan was defeated by their unbelief and faintheartedness, and, as a punishment, they were compelled to sojourn forty years in the wilderness of Kadesh (Paran, Sin). It was here and now that the people went to school with Moses; here, at the sanctuary of the camp, he declared law and judgment; and here, according to the view of the oldest tradition, the foundations of the Torah were laid. The region of Kadesh was also the scene of almost all the miracles and other circumstances we read about Moses. Here he showed himself to be at once the father and mother of the people, their judge, priest, and seer. It was not till toward the very close of his life that he led the Israelites from Kadesh into northern Moab, which he wrested from the Amorite king, Sihon of Heshbon. Here he died on Mount Pisgah or Nebo, after taking leave of the people in the great legislative address of Deuteronomy.

MOSES OF CHORENE was a native of Khor'ni in Tarôn, a district of the Armenian province of Turuberan. According to the only trustworthy authority—the *History of Armenia* which bears his name—he was a pupil of the two fathers of Armenian literature, the patriarch or catholicos Sahak the Great and the vartabed Mesrôb.

Of the works of Moses the best known is the *History of Armenia*, or, as the more exact title runs, the *Genealogical Account of Great Armenia*.

MOSHEIM, JOHANN LORENZ VON, well known as a church historian, but also distinguished in his day as a master of eloquence, was born at Lübeck on October 9th. There is some uncertainty as to the year, but the

probability is in favor of 1693 or 1694. He died at Göttingen on September 9, 1755, shortly after the completion of a new and greatly improved edition of his *Church History*.

MOSQUE (*Jāmi'*, or more fully, *Masjid Jāmi'*, the place of congregational prayer). Owing to the almost complete absence of ritual in the Moslem worship, the mosque, at least in its earlier forms, is one of the simplest of all religious buildings—its normal arrangement being an open court surrounded by a covered cloister, in the center of which is a cistern for the ablutions requisite before prayer; the side of the mosque which is toward Mecca is occupied by a roofed building or place reserved for prayer, sometimes screened off from the court, but frequently quite open toward it. In the center of this sanctuary is a niche showing the direction of Mecca; and by the side of the niche is a lofty pulpit. In front of the pulpit is a raised platform from which certain exhortations are chanted, and near it one or more seats and lecterns combined from which chapters of the Koran are read to the people.

Minarets were not built during the first half century after the Flight, but now as a rule no mosque is without at least one. From the upper gallery of this the *Moedhdhin* announces to the faithful the times for prayer—five times during the day, and twice at night. Blind men are generally selected for this office, so that they may not overlook the neighboring houses.

Most mosques have endowed property, which is administered by a warden (*Nāzir*), who also appoints the imāms and other officials. The larger mosques have two imāms; one is called (in Arabia and Egypt) the *Khatib*, and he preaches the sermon on Fridays (the Moslem Sabbath); the other, the *Rātib*, reads the Koran, and recites the five daily prayers, standing close to the *Mihrab*, and leading the congregation, who repeat the prayers with him, and closely follow his postures. The imāms do not form a priestly sect; they generally have other occupations, such as teaching in a school or keeping a shop, and may at any time be dismissed by the warden, in which case they lose the title of imām. Doorkeepers and attendants to sweep the floor, trim the lamps, and perform other menial offices, are attached to each mosque, in numbers varying according to its size and endowment. Moslem women, as a rule, are expected to say their prayers at home, but in some few mosques they are admitted to one part specially screened off for them. This is the case in the mosque Sitta Zainab in Cairo. In the Aksá mosque at Jerusalem, there is a latticed balcony for the women, who can see without being visible to the male worshippers below.

The greatest possible splendor of both material and workmanship is often lavished on the building and its fittings. The whole outside is frequently decorated with the most elaborate surface-carving in stone or marble, the pavement of the richest marbles inlaid in intricate patterns, the walls paneled in a similar way, or decorated with the most minute mosaics of glass, mother-of-pearl, agates and other costly stones. The central niche and the pulpit are of special magnificence; and if the latter is of wood it is often covered with delicate ivory carvings, and inlay of pearl and ebony. Very beautiful surface-ornament, executed in hard stucco, and enriched with gold and colors, is used to decorate arches, wall-surfaces, and the pendentives of domes, which latter generally have the so-called "stalactite" form of ornament—one of great beauty and complexity. The woodwork of doors, screens, and ceilings is frequently very gorgeous with carving, inlay, and elaborate painting; the whole of the doors outside are often covered with very delicate pierced and embossed work in

bronze, or more rarely iron. The magnificent tiles from Persia, Damascus and Rhodes, enameled in brilliant blue, green, and red, on a white ground, are often used to cover the walls. Traceried windows in pierced marble or stucco work often occur; these are filled with brilliant colored glass, always in very small pieces, forming a transparent mosaic of jewel-like richness. Lamps of enameled glass, or of bronze inlaid with silver, were once common, but are now rapidly disappearing.

Some mosques, especially the Karúbín mosque at Fez in Morocco, possess a collection of magnificent illuminated MSS., chiefly copies of the Koran and other religious books; in the large collection at Fez, MSS. of Aristotle's *Natural History*, with the works of Averroes and other commentators, exist in considerable number; some few of the MSS. are as early as the tenth century.

MOSQUITO (sometimes written "Mosquita"), a Spanish word signifying "little fly," is a name popularly applied to certain annoying dipterous insects, and, strictly speaking, it should probably be used only for species of *Culicidae* (and for the genus *Culex* in particular), for which "gnat" is the English synonym; but in many countries it is by almost common consent applied to all small dipterous insects that suck human blood, and therefore includes what we know as "sand-flies," "midges," etc., of the genera *Ceratopogon*, *Simulium*, and others. A distinction is often falsely drawn between "mosquito" and "gnat," the former being supposed to represent an insect native chiefly of hot climates, whereas the latter is our own too-well-known pest. In effect the terms are really synonymous, and any actual difference can only be specific. The "mosquitoes" of high northern latitudes may be species both of *Culex* and of *Simulium*.

Accounts of the numbers of these insects in tropical countries and in high latitudes, and of their irritating attacks, are to be met with—seldom exaggerated—in most books of travel. It is only the female that bites; and, as it is but a very small proportion of them that can ever taste human blood or that of any warm-blooded animal, blood would not appear to be essential to their welfare. It has been suggested that warm blood may have an influence on the ova, but it cannot be supposed that the eggs of those multitudes of individuals that never get a chance to taste blood are necessarily infertile; everything tends to prove the opposite.

MOSQUITO COAST. See NICARAGUA.

MOSESSES, or **MUSCI**, one of the two divisions of the botanical class *Muscineae*, which includes also the Liverworts or *Hepaticae*.

MOSSLEY, a manufacturing town of Lancashire, England, is situated on the London and Northwestern Railway and on the Huddersfield canal, near the west bank of the Tame, which here separates Lancashire from Cheshire, three miles northeast of Ashton-under-Lyne, and ten east-northeast of Manchester. The total population was about 16,000 in 1901.

MOSTAR, the chief town of Herzegovina, is built on both banks of the Narenta, about thirty-five miles from its mouth, and forty miles southwest of Serajevo (Bosna Serai), the capital of Bosnia. Pop., 14,370.

MOTANABBI, or **MOTENEBBI**. Abú 'l-Tayyib Ahmed ibn al-Hosain of Cufa, called Al-Motanabbi is the most famous representative of the last period of Arabic poetry, though some Eastern critics place him below Abú Tammām. Born about 916; died, 965.

MOTHER-OF-PEARL. The shells of many molluscous animals display a brilliant pearly and iridescent luster, resulting from the peculiar manner in which the layers of calcareous matter of which they are composed

have been successively formed. Such shells, even when small in size, form bright and, specially to the untutored eye, attractive ornaments, and as such are used for necklaces and similar purposes. When the shells are of sufficient size to cut and shape for purposes of utility, they become an article of some commercial importance under the name of Mother-of-Pearl. This term, though applicable to all pearly shells, is in commerce principally applied to the shells of the bivalve pearl-mussel *Meleagrina margaritifera*, which is the principal source of the commercial product. The largest and steadiest consumption of mother-of-pearl is in the button trade, and much is also consumed by cutlers for handles of fruit and dessert knives and forks, pocket-knives, etc. It is also used in the inlaying of Japanese and Chinese lacquers, European lacquered papier-mâché work, trays, etc., and as an ornamental inlay generally. In an innumerable variety of small and fancy articles mother-of-pearl is also employed, its use being limited only by the moderate dimensions and thickness of material obtainable, and its rather brittle nature. The carving of pilgrim shells and the elaboration of crucifixes and ornamental work in mother-of-pearl is a distinctive industry of the monks and other inhabitants of Bethlehem. Among the South Sea Islands the shell is largely fashioned into fishing-hooks, a purpose for which its brilliant conspicuous appearance appears to render it suitable without the addition of any bait or other lure.

MOTHERWELL, a police burgh of Lanarkshire, Scotland, is situated on the Caledonian Railway, a short distance from the right bank of the Clyde, two miles northeast of Hamilton and eleven east-southeast of Glasgow. The village, which takes its name from an old well dedicated to the Virgin, contained only 900 inhabitants in 1851, and owes its rapid increase to the coal and iron mines in the neighborhood. It possesses one of the largest ironworks in Scotland, and also extensive engineering works. Population about 20,000.

MOTHERWELL, WILLIAM, poet, antiquary, and journalist, born in Glasgow, 1797, rendered service in the collection of fugitive border poetry and wrote one or two very touching songs in the Scotch dialect, dying in 1835, before he had fulfilled the promise of his earlier work.

MOTHS. See BUTTERFLIES.

MOTLEY, JOHN LOTHROP, the well-known historian of the Dutch Republic, was born April 15, 1814, at Dorchester, now a part of Boston, Mass., and from 1827 was educated at Harvard, where he graduated in 1831. He then studied for two years at Göttingen and Berlin, and after a period of European travel, chiefly in Italy, returned to America in 1834, where he became a student of law, and ultimately was called to the bar. In 1837 he married, and two years afterward he published anonymously his earliest literary work, a two-volume novel, entitled *Morton's Hope, or the Memoirs of a Young Provincial*, which attained, and indeed deserved, only a moderate success. In 1841 he received his first diplomatic appointment, being made secretary of legation to the Russian mission, but, finding the atmosphere of St. Petersburg uncongenial, he resigned his post within a few months and definitely resolved on a literary career. Besides contributing various historical and critical essays to the *North American Review*, he published in 1849, again anonymously, a second novel entitled *Merry Mount, a Romance of the Massachusetts Colony*. About the year 1846 the project of writing a history of Holland had begun to take shape in his mind, and he had already prepared a considerable quantity of MS., when, finding the materials at his disposal in the United States quite inadequate for the completion of his work, he resolved to migrate to Europe along with

his family in 1851. The next five years were spent at Berlin, Dresden, Brussels, and the Hague in laborious investigation of the archives preserved in those capitals, and resulted in 1856 in the publication of *The Rise of the Dutch Republic, a History* (London and New York, 3 vols. 8vo). This work, which, after a large historical introduction, minutely follows the history of the Low Countries from the abdication of Charles in 1555 down to the assassination of William the Silent in 1584, immediately became highly popular by its graphic manner and the warm and sympathetic spirit in which it was written, while at the same time it was frankly recognized by scholars as a painstaking and conscientious piece of original work. It speedily passed through many English editions, was translated into French in 1859, and also into Dutch, as well as into German and Russian. Pursuing his researches in England, France, Belgium, and Holland, Motley was able to publish in 1860 the first two volumes of the *History of the United Netherlands*, covering the period from the death of William the Silent in 1584 to shortly after the destruction of the Armada, by which the Spanish project for subjugating England and reconquering the Netherlands was finally defeated. This work, which was on a somewhat larger scale than the preceding, embodied the results of a still greater amount of original research, not only in the Dutch archives, in the copies of the Simancas archives, and in the portions of those archives still retained in Paris, but also in the London State Paper Office, and in the MS. department of the British Museum. By two new volumes published in 1868 the work was brought down to the twelve years' truce in 1609, and it was announced that the author was engaged in writing a continuation which should embrace the history of the Thirty Years' War. Meanwhile Motley from the close of 1861 to 1867 had held the post of United States minister at Vienna; in 1869 he was appointed to a similar position at the court of St. James, but was recalled in 1870. After a short visit to Holland he again took up his residence in England, where *The Life and Death of John Barneveld, Advocate of Holland, with a view of the primary Causes of the Thirty Years' War* (2 vols.), appeared in 1874. Ill health now began to interfere with sustained literary work, and after a protracted period of failing vigor, he died at Kingston Russell House, near Dorchester, Dorsetshire, on May 29, 1877.

MOTMOT, according to Hernandez in his *Historia Avium Novæ Hispaniæ*, published at Rome in 1651, was the Mexican name of a bird which he described well enough to leave no doubt as to what he meant; but the word being soon after printed *Momot* by Nieremberg and others gave rise to the Latinized *Momotus*, invented by Brisson as a generic term, which has since been generally adopted by ornithologists, though *Motmot* has been retained as the English form. The *Motmots* have been for many years recognized as forming a distinct family, *Momotidae* or *Prionitidae*, of the heterogeneous assemblage known as *Picaria* or *Coccygomorpha*. In outward appearance they have an undoubted resemblance to Bee-eaters, but, though beautiful birds, various shades of blue and green predominating in their plumage, they do not exhibit such decided and brilliant colors; and, while the Bee-eaters are only found in the Old World, the *Motmots* are a purely Neotropical form, extending from southern Mexico to Paraguay, and the majority of species inhabit Central America. They are said to be solitary birds, or at most living in pairs, among the gloomy forests, where they sit on the underwood nearly motionless, or only jerking their long tail as the cry "houtou," or something like it, is uttered. Their ordinary food is small reptiles, insects, and fruits. The nest of one species, as observed by Mr. Robert

Owen, and is at the end of a hole bored in the bank of a watercourse, and the eggs are pure white and glossy. Little else has been recorded of their ways.

MOTRIL, a town of Spain in the province of Granada, is charmingly situated at the foot of an offshoot of the Sierra Nevada, on the edge of a rich alluvial plain about a mile from the Mediterranean and forty miles south-southeast from Granada, with which it is connected by a good carriage road. The population of Motril in 1888 was 17,000. The harbor (El Puerto de Motril) lies about six and one-half miles to the south-eastward at the village of Calahonda.

MOTT, VALENTINE, an eminent American surgeon, was born at Long Island, N. Y., on August 20, 1785. He graduated at Columbia College, studied under Sir Astley Cooper in London, and also spent a winter in Edinburgh. After acting as demonstrator of anatomy he was appointed professor of surgery in Columbia College in 1809. From 1811 to 1834 he was in very extensive practice as a surgeon, and most successful as a teacher and operator. He tied the innominate artery in 1818; the patient lived twenty-six days. He performed a similar operation on the carotid forty-six times with good results; and in 1827 he was also successful in the case of the common iliac. He is said to have performed 1,000 amputations and 165 lithotomies. After spending seven years in Europe (1834-1841) Mott returned to New York and founded the university medical college of that city. He translated Velpeau's *Operative Surgery*, and was foreign associate of the Imperial Academy of Medicine of Paris. His death occurred on April 26, 1865.

MOTTEVILLE, FRANÇOISE BERTAUT, MADAME DE, was born in 1621. She died December 29, 1689. Some letters of hers are preserved, especially a curious correspondence with "La Grande Mademoiselle" on marriage, but her chief work is her *Mémoires*, which are in effect a history of Anne of Austria, written briefly till the date of Madame de Motteville's return to court, and then with fullness.

MOUKDEN. See MANCHURIA.

MOULINS, chief town of the French department of Allier, is situated 195 miles by rail south-southeast from Paris on the right bank of the Allier, which is here crossed by a remarkable bridge about 1,000 feet in length, consisting of thirteen semicircular arches. The town, which stands at an altitude of about 740 feet above sea-level, is adorned with gardens and fine boulevards, and still contains several buildings of historical interest and many houses of the Middle Ages. Among other objects of interest in Moulins are some remains of the old chateau of the dukes of Bourbon, and the clock tower. The library of nearly 25,000 volumes contains a manuscript Bible of the twelfth century which was used at the council of Constance in 1415. There are no industries of importance, except the manufacture of wire ropes for mines, and of sulphate of barium. The population in 1901 was about 25,000.

MOULMEIN. See MAULMAIN.

MOUND BUILDERS. For a vast distance, covering a stretch of country extending from the Appalachian range on the east to the Rocky Mountains on the west, and from Canada to the Gulf of Mexico, in short throughout the whole valley watered by the Mississippi system, there are found hillocks of earth, tumuli, or mounds, the questions of the object of which and who were their builders, must ever remain undecided. In view of their mode of construction and their contents, the proposition that they were built by the races inhabiting America when this continent came within the ken of history, seems negatived. These mounds, unlike those usually found as the relics of barbarous, extinct races, are not

confined to any one particular purpose—not only bearing evidence of having been used for sepulture, but for almost every purpose likely to be required by the exigencies of primitive life.

The States of Illinois, Missouri, and Ohio are particularly rich in these remains. Indeed, so numerous are they in the vicinity of St. Louis that the place has been dubbed the "Mound City." The Gulf States also contain large numbers of these mounds, while occasional specimens are found east of the Alleghanies and west of the Rockies—but the great Mississippi valley was the home *par excellence* of the mound builders. These mediate lands seem to have been the home of a race whose civilization was far beyond that of the Indians we have knowledge of, and whose existence was continually threatened by their more savage neighbors, and was one continuous struggle for self-preservation. This race seems to have been beset both on the east and west, for on the west, among the mountain fastnesses of the Rockies, we find the tenantless homes of the cliff-dwellers, which the former race had used as fortresses for protection, while as we approach the Alleghanies we find an increasing number of defensive mounds, the deduction being that the enemies of the denizens of the Mississippi valley inhabited and made their strongholds amidst the two great mountain regions of the continent, from the fastnesses of which they descended in continual forays against their lowland neighbors. Who are the representatives of these two races, and which survived the contest?

These defensive mounds are usually built in positions which give them strategic importance—such as tops of hills, on river bluffs—always near water supply. Their disposition is such as would indicate that they were not merely temporary intrenchments or fortifications, but that they were intended as permanent garrison points to hold in check any invaders of the lands inhabited by the builders. Judging from the sites usually selected, it would appear that these were the regions along the water courses, while the localities more remote, were a sort of Tom Tiddler's ground, belonging to neither party, the possession of which was disputed by both. The fortifications are of various shapes and are skillfully disposed—some authorities claiming to be able to trace a concatenation of these strongholds running in a continuous line from New York to Ohio. The race which built them was evidently endowed with high qualifications of skill and patience. One of the most conspicuous of these mounds is Fort Ancient, near the Little Miami River, Ohio. It is situated at the top of a steep acclivity, the walls being of a tough clay, ranging in height from five to twenty feet, according to the strength of the spot to be defended. They inclose a space little over 100 acres in extent, yet they measure over five miles in length, so serpentine is their course. It is divided into two portions, each portion being tenable in case of capture of the other. In the walls are numerous gates, and from large accumulations of stones found inside the fort it is supposed that these gates were barricaded in time of war with these stones. There are also numerous water reservoirs (connected with springs) in the interior of the fort. This fortress must have presented a formidable obstacle to an enemy. It is in general the counterpart of all the other defensive mounds, and its description will suffice for all of them. The largest mound of this kind is near Chillicothe, and incloses 145 acres. In connection with these defensive works are a number of high mounds evidently intended as observatories or watch-towers from which the motions of the enemy could be discerned.

Coming down into the lower levels of the valley we find a different species of mounds. They are not, as in

case of those occupying high places, irregular in shape, but are usually geometrical figures of uniform regularity, such as octagons, squares, etc. What their object was is unknown, and no satisfactory hypothesis has been offered. They have been called sacred mounds, but this appellation is purely fanciful. One of these aggregations of mounds is found at Newark, Ohio. It comprises an octagon of fifty acres, a square of thirty-five acres, and two circles, one of twenty-nine and the other of twenty acres. These are all joined by avenues and surrounded by ditches, and are semi-military in character; although probably defense was not the prime object in their erection, yet their construction, even if they were intended for religious purposes, gives evidence that the people were surrounded by enemies and were prepared for invasion and strife even in the midst of their worship. These mounds cover a space of four miles in length.

There is still another kind of mounds, found in these regions, to which the name of temple mounds has been given. The largest of this class is to be found at Cahokia, Ill. It measures 700x500 feet at the base and is 89 feet high. On one side is a terrace 160x300 feet. The summit is a level space 200x450 feet; this was surmounted by a small conical mound or altar 10 feet high, in which human bones and useful articles were found. A smaller series of mounds of kindred shape to these mentioned last are supposed to have been altars of sacrifice. They consist of strata of gravel, earth, and sand, covering fireplaces or hearths at the level of the ground. The mounds are seldom more than two feet in height. From the nature of the remains found in the vicinity of these mounds, the inference has been drawn that they were places for human sacrifice, although the argument for their being places of cremation would be equally good from the same premises.

The most numerous species of mounds, however, seem indubitably to have been places of sepulture. These vary in height and differ from the other mounds, in the fact that they are never found inside an inclosure. These mounds are rich in relics, which have thrown great light on the arts and manufactures of their builders, but give us nothing in regard to the history of their origin or their extinction. The largest mound of this class is Grave Creek Mound, near Wheeling, W. Va. It is 70 feet high and nearly 1,000 feet in circumference. It contained two chambers—an upper and lower. It was excavated in 1839, and three skeletons were found—two in one chamber and one in the other. A large number of beads were found also, together with a number of other articles. Various other mounds of like nature have been opened, and from the contents of some it has been argued that it was customary to sacrifice men and women on the occasion of the sepulture of a chief or prominent personage.

In some portions of the country mounds exist in the shape of animals. One of these—the Elephant mound in Grant county, Wis.—raises the interesting question as to where the builders of the mound obtained their model. Where did they see the elephant after which they fashioned the construction? In addition to the mounds mentioned above traces are found of other works, such as irrigation canals, and other agricultural devices, belonging to the same age and race. This in conjunction with other facts, indicates that the mound builders were an agricultural people, and derived their chief subsistence from this source. The articles found in the mounds lead us to believe that the race who built them had no inconsiderable share of civilization. The list includes pottery of various kinds, evincing a high degree of skill, besides other forms of earthenware.

Pipes of various kinds, some elaborately carved and made of various materials, are found in great numbers. Vases and jars of stone and masks of the human face, also testify to their knowledge of the sculptor's art. Copper seems to be the only mineral they possessed in general use. Stone implements abound in great variety. The question then arises, who were the mound builders? This question no man can yet answer, although archæologists claim they are slowly working out the clew to the mystery. In the light of the present the most tenable theory is that they were identical in race with our present Indians, but different in habits, and that they were finally overcome and extinguished by their more warlike neighbors—the "hunting tribes," whose descendants we have yet with us in the person of the present savage.

MOUNTAINS. For mountains in general see **GEOLOGY**. The more important groups of mountains are discussed under separate headings, as ALPS, HIMALAYA, ANDES, etc.

MOUNT CARMEL, a borough of Northumberland county, Pa., and a noted center of anthracite coal production. The town has good railroad and telegraph facilities, banks, stores and some manufactures, and a population of 8254.

MOUNT HOLLY, capital of Burlington county, N. J., is a thriving manufacturing city, nineteen miles from Philadelphia. It has good railroad, telegraph, and banking facilities, and a population (1890) of 5,500.

MOUNT STERLING, the capital of Montgomery county, Ky., with a population of 5,500, has considerable manufactures of carriages, furniture, etc., and some shipping trade.

MOUNT VERNON, a village of Westchester county, N. Y., with a population of 20,346, is situated on the Bronx river, at the intersection of several railroads. It has some manufactories, and is well supplied with churches and schools.

MOUNT VERNON, the capital of Knox county, Ohio, is a busy manufacturing place of 6,016 inhabitants. There is considerable water-power, which is utilized for flouring mills and factories.

MOUNT VERNON, the capital of Posey county, Ind., is situated on the Ohio river, thirty-three miles from Evansville, and has railroad facilities, banks, factories, and about 5,600 people.

MOUNT VERNON, in Fairfax county, Va., on the right bank of the Potomac, fifteen miles from Washington, D. C., is famous as the home and the burial place of George Washington.

MOURZUK, or **MURZUK**. See **FEZZAN**.

MOUSE. The bright and active, though mischievous, little animal known to us by the name of Mouse and its close relative the common rat are the most familiar and also the most typical members of the *Murina*, a sub-family containing about 250 species assignable to no less than eighteen distinct genera, all of which, however, are so superficially alike that one or other of the English names rat or mouse would be fairly appropriate to any of them. Together they form one, and that by far the largest and most important, of the ten sub-families into which the Muridæ or rat family (order *Rodentia*) are divisible. Their nearest neighbors are the Tree-mice (*Dendromyina*) and the Hamsters (*Cricetina*), from which they differ by various cranial and dental characters. Among themselves they have for the most part very strong resemblances; nearly all are of very rat-like exterior, of light and active build, with large ears, bright and well-developed eyes, long and scaly tails, and nearly always of dull and inconspicuous coloration, as is suitable to their usually burrowing and nocturnal habits.

MOUSE-BIRD, the name by which in Cape Colony and Natal the members of the genus *Colius* of Brisson are known—partly, it would seem, from their general coloration, but more probably from their singular habit of creeping along the boughs of trees with the whole tarsus applied to the branch. By the earlier systematists, who had few opportunities of examining the internal structure of exotic forms, *Colius* was placed among the *Fringillidae*; but nearly all travelers who had seen one or another species of it in life demurred to that view. The *Coliidae* are small birds, with a rather finch-like bill, a more or less crested head, a very long tail, and generally of a dun or slate-colored plumage that sometimes brightens into blue or is pleasingly diversified with white or chestnut. They feed almost wholly on fruits, but occasionally take insects, in quest of which they pass in bands of fifteen or twenty from tree to tree, and hang in all attitudes from the branches as they feed. It is even said that they sleep suspended by their powerful and versatile toes. Seven species are believed to exist, all belonging to the Ethiopian Region (of which the Family is one of the most characteristic), and ranging from Abyssinia southward. Three species inhabit Cape Colony.

MOVERS, FRANZ KARL, a German Orientalist, was born at Koesfeld, July 17, 1806, studied at Münster, was consecrated priest in 1829, and was professor in the Catholic theological faculty at Breslau from 1839 to his death on September 28, 1856.

MOZAMBIQUE, a colonial province of Portugal, extending for about 1,200 miles along the east coast of Africa, from Cape Delgado to Lorenzo Marques, on the south side of Delagoa Bay. On paper it forms an imposing territory of at least 38,000 square miles, without any definite limit toward the interior; but, in reality, it consists of a few settlements and military posts, feebly authoritative over the surrounding tribes. The Portuguese divide the province into the military districts of Mozambique, Cape Delgado, Angoche, Quilimane, Tete, Sofala, and Lorenzo Marques, with the presidential territory of Bazaruto. The small coral island of Mozambique, which gives its name to the province and contains the provincial capital, lies about three miles off the coast of the peninsula Mossuril. It is defended by three forts, of which the principal, St. Sebastian, is built entirely of stone brought from Portugal in 1510. The streets of the town (properly St. Sebastian of Mozambique) are narrow and crooked, and the stone-built flat-roofed houses are for the most part dull and lifeless in spite of their being washed with pink, brown, and white. Its principal buildings are the palace of the governor-general, formerly a Jesuit college, the custom-house, the hospital, and three churches. The population includes, besides Portuguese and Africans, Banyans, Parsees, and Arabs. The district of Cape Delgado includes the archipelago of the Querimba Islands, and, on the opposite mainland, Mucimba, Pangane, Lumbo, Quisanga, Montepes, Arimba, besides the colony of Europeans founded in 1857 on the Bay of Pemba. The chief town is Ibo, with over 2,000 inhabitants, situated on the island of the same name. Of the twenty-eight islands some are nearly deserted, although both their climate and that of the opposite coast is good. Ibo has a considerable trade, the exports being sesame, calumba root, oil seeds, ivory, and wax. Turtle fishing is carried on; but little has been done to develop the agricultural capabilities of the district. The district of Angoche extends nominally as far south as the Querimbo river, and includes the Angoche and Primeria islands, and a small settlement on the Angoche river. The trade is very limited. The district of Quilimane is the center of the commerce of the Zambesi, and the town ranks next to

Mozambique as a port. Near the village of St. Marçal de Sena, the headquarters of the sub-military government of Sena, there are said to be very rich gold mines. Tete, to the northwest of Sena, is situated in the center of an immense coal-basin. It includes a number of settlements on the Zambesi, reaching as far as Zumbo, where a great native fair is held. The chief town is St. Thiajo Major, about 250 miles from the mouth of the Zambesi. The climate is genial, and the soil is specially suitable for wheat, maize, tobacco, cotton, and sugar-cane. The chief town of the Sofala district is Sofala, on the island of Chiloeane, in the estuary of the Sofala river. It was the original capital of the colony and still possesses a good harbor, which, however, is not always easily accessible, and requires good piloting. The district is rich in gold mines, and is supposed by some to be the Ophir with which King Solomon traded. Inhambane, opposite Gasa, is very much encroached upon by the Zulu tribes. The natural products are similar to those in the Zambesi valley. A species of oil-plant is very abundant, as well as amber and sarsaparilla. The district of Lorenzo Marques is almost wholly confined to the town of that name (*q.v.*). The Archipelago of Bazaruto comprises the islands of Bazaruto, Benguerua, Xegine, Bango and Santa Carolina. The soil and climate are both excellent, and there are important pearl fisheries.

MOZARAB, Spanish *Mozdrabe* is a corruption of the Arabic *Mustarib*, coll. *Mustariba*, which denotes persons not Arab by race who have assimilated themselves to the Arabs. This name was applied by the Moslems in Spain to the Christian communities existing among them, in Cordova, Seville, Toledo, and other large cities, in the exercise of their own laws and religion. The ancient liturgy used by the Christians of Toledo, the first great body of this kind who were freed from the Moslem yoke, is commonly known as Mozarabic.

MOZART, WOLFGANG AMADEUS, one of the greatest musicians the world has ever produced, was born at Salzburg, January 27, 1756.

On April 10, 1764, Leopold Mozart brought his family to England, engaging a lodging in Cecil Court, St. Martin's Lane, whence he afterward removed to Frith Street, Soho. On April 27th and May 19th Wolfgang played before the royal family with immense success, accompanying the queen in a song and playing at sight anything that the king set before him. The little artist gave a public concert at the Great Room in Spring Gardens on June 5th, and on the 29th played a concerto at Ranelagh. He now made his first attempt at the composition of a symphony; published a third set of sonatas, dedicated to the queen; and wrote an anthem for four voices entitled *God is our Refuge*, for presentation to the British Museum. In July, 1764, he played at Tunbridge Wells. Toward the close of 1766 we find him at home in Salzburg, diligently studying Fux's *Gradus ad Parnassum*. In September, 1767, he paid a second visit to Vienna, and at the suggestion of the emperor Joseph II. composed an opera buffa, *La Finta Semplice*.

In October, 1770, Wolfgang and his father returned to Milan for the completion and production of the new opera. The libretto, entitled *Mitridate, Re di Ponto*, was furnished by an obscure poet from Turin, to the great disappointment of the young maestro, who had hoped to set a drama by Metastasio. The progress of the work was interrupted from time to time by the miserable intrigues which seem inseparable from the lyric stage, exacerbated in this particular case by the jealousy of the resident professors, who refused to believe either that an Italian opera could be written by

native of Germany, or that a boy of fourteen could manage the orchestra of La Scala, at that time the largest in Europe. Fortunately the detractors were effectively silenced at the first full rehearsal; and on December 26th, Wolfgang took his seat at the harpsichord and directed his work amidst a storm of genuine applause. The success of the piece was unprecedented. It had a continuous run of twenty nights, and delighted even the most captious critics.

Wolfgang's triumph was now complete. After playing with his usual success in Turin, Verona, Venice, Padua, and other Italian cities, he returned with his father to Salzburg in March, 1771, commissioned to compose a grand dramatic serenata for the approaching marriage of the archduke Ferdinand, and an opera for La Scala, to be performed during the season of 1773. The wedding took place at Milan on October 21st; and the serenata, *Ascanio in Alba*, was produced with an effect which completely eclipsed Hasse's new opera, *Ruggiero*, composed for the same festivity. The empress Maria Theresa was so delighted with it that in addition to his fee she presented Wolfgang with a watch set with diamonds and enameled with her portrait; and Hasse, forgetful of his own defeat, generously uttered the often-quoted prophecy, "This boy will cause us all to be forgotten."

During the absence of Wolfgang and his father the good archbishop of Salzburg died; and in the spring of the year 1772 Hieronymus, count of Colloredo, was elected in his stead, to the horror of all who were acquainted with his real character. The Mozart family did their best to propitiate their new lord, for whose installation Wolfgang, after his return from Milan, composed an opera, *Il Sogno di Scipione*; but the newly-elected prelate had no taste for art, and was utterly incapable of appreciating the charm of any intellectual pursuit whatever. For the present, however, things went on smoothly. In October the father and son once more visited Milan for the preparation and production of the new opera, *Lucio Silla*, which was produced at Christmas with a success quite equal to that of *Mitridate*, and ran between twenty and thirty nights. Unfortunately, however, these artistic triumphs were far from profitable in their pecuniary aspect. The family grew poorer and poorer; and the archbishop Hieronymus was not the man to rescue them from penury.

In the meantime Wolfgang continued to produce new works with incredible rapidity. In 1775 he composed an opera for Munich, *La Finta Giardiniera*, produced on January 13th. In the following March he set to music Metastasio's dramatic cantata, *Il Re Pastore*. Concertos, masses, symphonies, sonatas, and other important works, both vocal and instrumental, followed each other without a pause. And this fertility of invention, instead of exhausting his genius, seemed only to stimulate it to still more indefatigable exertions.

He was engaged to compose an opera for Munich for the carnival of 1781. The libretto was furnished by the abbatte Varesco, court chaplain at Salzburg, a truly sympathetic collaborateur. On January 29, 1781, the work was produced under the title of *Idomeneo, Re di Creta* with triumphant success. By the emperor's command he wrote a German opera, *Die Entführung aus dem Serail*, which on July 16, 1782, was received with acclamation, and not long afterward was performed with equal success at Prague. This great work raised the national "singspiel" to a level commensurate with that which *Idomeneo* had already attained for the Italian "opera seria."

The next great event in Mozart's life was a disastrous one. Though Aloysia Weber had long since rejected him, his renewed intimacy with the family led to a most

unfortunate marriage with her younger sister, Constance, a woman who, neither his equal in intellect nor his superior in prudence, added little to the happiness of his life and less than nothing to its prosperity. The wedding took place at St. Stephen's on August 16, 1782. By the end of the year the thriftless pair were deeply in debt. Mozart composed incessantly, played at numberless concerts, and was in greater favor than ever at court and with the nobility; but to the last day of his life his purse was empty. He had, however, many kind friends, not the least affectionate of whom was the veteran Haydn, who was sincerely attached to him. With Gluck he was on terms of courteous intercourse only. Salieri detested him, and made no secret of his dislike.

Mozart's next dramatic venture was a German singspiel in one act, *Der Schauspieldirektor*, produced at Schönbrunn, February 7, 1786. Not quite three months later, on May 1st, he produced his marvellous *Le Nozze di Figaro*, the libretto for which was adapted from Beaumarchais by the abbé Da Ponte. The reception of this magnificent work was enthusiastic. But Vienna was a hotbed of intrigue. Everything that could be done by jealous plotters to mar the composer's success was done, and that so effectively that Mozart declared he would never bring out another opera in the city which treated him so meanly. Fortunately, *Figaro*, like *Die Entführung*, was repeated with brilliant success at Prague. Mozart went there to hear it, and received a commission to write an opera for the next season, with a fee of 100 ducats. Da Ponte furnished a libretto founded on Tirso de Molina's tale, *El Convidado de Piedra*, and entitled *Il Don Giovanni*. By October 28, 1787, the whole was ready with the exception of the overture, not a note of which was written on the evening before the performance. This circumstance has led to the idea that it was composed in haste, but it is certain that Mozart knew it all by heart and transcribed it during the night from memory, while his wife told fairy tales to keep him awake. The opera was produced on October 29th with extraordinary effect, and the overture, though played without rehearsal, was as successful as the rest of the music. Yet, when reproduced in Vienna, *Don Giovanni* pleased less than Salieri's comparatively worthless *Tarare*.

On returning to Vienna Mozart was appointed kammer-compositor to the emperor with a salary of 800 gulden (\$400). He also conducted Baron von Swieten's concerts, and composed great quantities both of sacred and secular music, but continued miserably poor, while his wife had become a confirmed invalid. In April, 1789, he accompanied Prince Lichnowski to Berlin, where King Frederick William II. offered him the post of "kapellmeister" with a salary of 3,000 thalers (\$2,250). Though most unwilling to quit the emperor's service, he informed him of the offer and requested leave to resign his appointment in Vienna. "Are you going to desert me, then?" asked the emperor; and Mozart, wounded by the reproach, remained to starve. The emperor now commissioned Mozart to compose another Italian opera, which was produced January 26, 1790, under the title *Così fan tutte*. Though the libretto by Da Ponte was too stupid for criticism, the music was delicious, and the opera would probably have had a long run but for the emperor's death on February 7th. The new emperor, Leopold II., was elected at Frankfurt in September, and Mozart went thither in the hope of giving some concerts, but he was obliged to sell his plate to pay the expenses of the journey, and returned in December. In March, 1791, Mozart consented to write a German opera upon an entirely new plan for Schikaneder, the

manager of the little theater in the Wieden suburb. The piece was addressed especially to the Freemasons and contained ceaseless allusions both in the words and music to the secrets of the brotherhood. Deeply interested in the affairs of a body of which he was himself a member, Mozart excelled himself in this new work, for the overture of which he invented a new art-form, that of the "symphonic fugue." He was rewarded for his labors by a brilliant artistic success, but Schikaneder alone reaped the financial benefit of the spectacle.

Before the completion of *Die Zauberflöte* a stranger called on Mozart, requesting him to compose a *Requiem* and offering to pay for it in advance. He began the work under the influence of superstitious fear, believing that the messenger had been sent from the other world to forewarn him of his own approaching death. Meanwhile he received a commission to compose an opera, *La Clemenza di Tito*, for the coronation of the emperor at Prague. He worked incessantly, and far beyond his strength. The coronation took place on September 6th, and its splendors threw the opera very much into the shade. *Die Zauberflöte* was produced on September 30th and had a splendid run. But the *Requiem* still remained unfinished; the stranger therefore made another appointment, paying a further sum in advance. Mozart worked at it unremittingly, hoping to make it his greatest work. His sacred music, though less florid than Haydn's, was even more voluptuously beautiful, perfect in its kind, though showing no trace of the stern grandeur of Handel, or the devotional purity of Palestrina. In the *Requiem* he surpassed himself, but he was not permitted to finish it. When the stranger called the third time the composer was no more. The score of the *Requiem* was completed by Süßmayer, whose task, simplified by the instructions he had received from Mozart on his death-bed, was a purely mechanical one. It is now known that the work was commissioned by Count Walsegg, who wished to perform it as his own.

Mozart died December 5, 1791, apparently from fever, though he believed himself poisoned. His funeral was a disgrace to the court, the emperor, the public, society itself. On the afternoon of the 6th his body was hurried to a pauper's grave; and because it rained Van Swieten, Süßmayer, and three other "friends" turned back and left him to be carried to his last long home alone.

MOZDOK, a Russian town in the government of the Caucasus and province of Stavropol, lies on the left bank of the Terek, fifty-eight miles north of Vladikavkas, with which it is connected by a highroad, and thirty-six and one-half miles east of the Prochladnaya station on the Kostoff-Vladikavkas railway. The population (8,766 in 1865; numbered 13,008 in 1897. Gardening and agriculture are the main means of subsistence, scarcely fifty individuals living by trade. The melons and water melons of Mozdok are widely famed; and though vine-growing was only begun in 1873, by 1876 there was a production of 563 casks of wine or 1,416,000 bottles.

MOZLEY, JAMES BOWLING, English theologian, was born in Lincolnshire in 1813. He died at Shoreham on January 4, 1878.

MTSENSK, (popularly called *Anchensk*), a district town of Russia, situated in the government of Orel on the navigable Zushá river, seventeen miles from its junction with the Oka, on the Moscow and Kursk railway, thirty-two miles to the northeast of Orel.

MUCILAGE, a term which denotes a viscid or glutinous mixture of water and any gummy vegetable substance. The principal sources of mucilaginous matters are enumerated under **GUM**. A mucilage indicates a

physical condition or property rather than any definite chemical constitution, and consequently it may possess various characters, but as a rule the term is restricted to the bodies which swell into a kind of jelly with water, having the insoluble gum bassorin as their principal constituent. Such mucilages are useful in medicine as emollients and demulcents, and in the arts as thickeners, (in calico-printing, dyeing, etc.)

MUGGLETON, LODOWICK, the founder of the sect of the Muggletonians, was born in Bishopsgate street, London, about the year 1610. His father was a farrier, but he himself was bred to be a tailor. In 1651 he began to have revelations by "a motional voice," and to proclaim himself and a brother tailor, John Reeve, as the two witnesses mentioned in the Apocalypse, and as the "true prophets of the only high, immortal, glorious God, Jesus Christ." An exposition of their doctrines was published in 1656 under the title of *The Divine Looking-Glass*. Among other views (besides the doctrine of the divine mission of the authors) this work taught that the distinction of the three persons in the Trinity is merely nominal, that God has a real human body, and that He left Elijah as His vicegerent in heaven when He Himself descended to die on the cross. These opinions, strange to say, gained considerable currency, and naturally also called forth much opposition. William Penn's book, *The New Witnesses proved Old Heretics* (1672), was directed against them, and in 1676 Muggleton was tried at the Old Bailey and convicted of blasphemy. Reeve died in 1658, but Muggleton survived till 1698. Even as late as 1846 *The Divine Looking-Glass* was reprinted by members of the sect, which is now, however, believed to be extinct.

MUGWUMP is a term of doubtful origin and most probably a euphonic invention and used as a designation for citizens who allege their country to be superior to their party and refuse to be bound by party nominations. It was first applied in 1884 to the republicans who refused to support James G. Blaine and who advocated the election of Grover Cleveland with a view to secure reform in the civil service. Invented as a term of political description, it now means one who is dissatisfied politically.

MÜHLHAUSEN, a busy manufacturing town of Thuringia in the district of Erfurt, Prussia, is situated on the right bank of the Unstrut, twenty-five miles to the northwest of Gotha. The great majority of the inhabitants, numbering 25,478 in 1901, are Protestants.

Mühlhausen is one of the oldest towns in Thuringia, and is said to have been fortified in 925.

MUIR, JOHN, Sanskrit scholar, was born February 5, 1810, in Glasgow. He died March 7, 1882.

MULA, a town of Spain, in the province of Murcia, is situated twenty-two miles to the westward of that town on the slope and summit of an eminence on the left bank of the Mula, a small tributary of the Segura, periodically liable to destructive floods. The industries and trade of the place are connected principally with agriculture. The population in 1897 was 12,597.

MULBERRY. The mulberry family (*Moraceæ*) is usually included, along with the closely-allied figs, bread-fruits, nettles, hops, planes, and elms, in one vast alliance of monochlamydeous Exogens, the order *Urticaceæ*. The *Moraceæ* include three sub-families, of which the typical genera are: *Dorstenia*, which is almost a Fig; *Broussonetia*, the Paper Mulberry of Japan, the East Indies, and the South Sea Islands; and *Morus*, the Mulberry proper, of which the ten or twelve species are all native to temperate regions in Asia and America, or to hill regions in their tropics, but are readily cultivated in similar climates in Europe, Africa, and Australia.

The Black Mulberry (*Morus nigra*, L.) is mainly cultivated for its purplish black compound fruit (a *sorosis* formed by the aggregated drupes of the whole female inflorescence), which is wholesome and palatable if eaten fresh from the tree before acetous fermentation has had time to set in. Save in syrup, and on account of its rich dark-red coloring matter, it has no longer any pharmaceutical uses.

The White Mulberry (*M. alba*, L.), so called from its nearly white fruit, is the one mainly employed in sericulture. There are many varieties, among which the Philippine Mulberry (var. *multicaulis*) is perhaps most highly esteemed. The American and Indian species (*M. americana* and *M. indica*, the latter not to be confounded with *Morinda citrifolia*, a cinchonaceous tree, sometimes also called Indian Mulberry) are also cultivated for the same purpose.

MULE. Though this term is not infrequently applied to the produce of two creatures of different species, and is synonymous with hybrid, yet in its ordinary acceptance it is employed to designate the offspring or "cross" between the equine and asinine species. There are two kinds of mules—the *Mule* proper, which is the hybrid produce of a male ass with a mare, and the *Hinny*, the offspring of a stallion and female ass. The mule is the more valuable of the two, and to its production the attention of breeders is entirely directed. Indeed, the hinny is so rarely produced, owing to the antipathy of the stallion to the female ass, that many authorities deny its existence.

Intercourse between the mare and male ass is very seldom voluntary; indeed, horses will not associate with asses, and combats between them are often serious. The male ass will freely mate with the mare, but the latter has a strong repugnance to him, as has also the stallion for the female ass. Hence in mule-breeding the mare has to be blindfolded and otherwise deceived, or secured in a travis or by ropes, before she will allow the ass to approach her. Fecundation is not so certain between the ass and horse species as between the male and female of either species, for, while of four mares three at least will be fecundated by the stallion, as a rule only two will be so by the ass.

Fecundation of the hybrid female by the male ass or the stallion is not very rare; but it is otherwise with the male hybrid, no instance being recorded in which he has been prolific, though physically the animal appears to be perfect, and often exhibits an intense ardor for the female. The female mule, when fecundated, seldom reaches the natural term of pregnancy, and rarely brings forth a living offspring. The duration of gestation in a mare impregnated by the ass is a little longer than in impregnation by the stallion—the average being 375 days. Abortion readily occurs, and more care is necessary than in breeding horses or asses.

The mule foal is not so strong on its limbs as the horse foal, and it does not grow so quickly. It is longer in reaching maturity, for it is of little use under four years of age; but it is useful for a longer period than the horse, often working until it is twenty, thirty, and even forty years of age. When full grown the mule is from thirteen to fifteen, and sometimes sixteen hands high; but those from fourteen to fifteen hands are generally preferred.

The mule, like the ass, enjoys an extraordinary immunity from disease. After the campaign in Egypt in 1882 the English horses suffered most extensively and severely from a kind of malarious fever, but the mules were entirely exempt. A similar exemption has been noticed during the prevalence of epizootic maladies at other times. Nevertheless those diseases which attack the mule (and the asinine species) run their course with

great rapidity; for example, glanders, which often appears in a chronic form in the horse, is most acute in the mule and ass. These are also very liable to tetanus from trifling injuries.

Good mules are reared in North and South America, the principal districts for breeding them in the United States being Kentucky, Missouri, and Kansas. The Kentucky mules are well shaped and showy, being derived from nearly thoroughbred mares known as Kentucky trotters, while those reared in Missouri are hardy, and can endure much privation and hardship. The Mexican mule, bred by a male ass out of a mustang mare, is also a very hardy, strong, and useful animal.

MÜLHAUSEN (in French *Mulhouse*), the chief town of a circle and the industrial center of Upper Alsace, Germany, lies between the Ill, an affluent of the Rhine, and the Rhine-Rhone Canal, about fifty-six miles to the south of Strasburg and eighteen to the northwest of Basel. The population was in 1880, 63,629, of whom 47,395 were Roman Catholic.

MÜLHEIM-AM-RHEIN, the chief town of a circle in the district of Cologne, Prussia, lies on the right bank of the Rhine, two miles below Cologne. The population in 1880 was 20,420.

MÜLHEIM-AN-DER-RUHR, the chief town of a circle in the district of Düsseldorf, Prussia, is situated on the Ruhr, an affluent of the Rhine, about seven miles from Essen, and at the intersection of several railways. Like most of the towns in this district, Mülheim finds its chief industry in iron-working, and contains numerous blast furnaces, rolling mills, foundries, and engine works. In 1880 it contained 22,146 inhabitants, about two-thirds of whom were Protestants.

MULL, an island of Scotland, county of Argyll, and the largest of the Inner Hebrides, is bounded west by the Atlantic, north by Loch Sunart, northeast by the Sound of Mull, and southeast by the Firth of Lorn. Its area comprises about 235,000 acres, of which only about 13,000 are arable. The population of the island in 1881 was only 5,229.

MÜLLER, JOHANN. See REGIOMONTANUS.

MÜLLER, JOHANN VON, an eminent Swiss historian, was born on January 3, 1752, at Schaffhausen, where his father was a clergyman and rector of the gymnasium. On May 29, 1809, he died at Cassel.

MÜLLER, JOHANNES, one of the most distinguished physiologists of Germany, was born at Coblenz on July 14, 1801. He became a privat-docent in the university of Bonn in 1824. In 1826 he was appointed extraordinary professor of physiology in the same university, and he became the ordinary professor in 1830. In 1833 he was removed to the university of Berlin, where he filled the chair of anatomy and physiology with great distinction until his death on April 28, 1858.

MÜLLER, KARL OTFRIED, an eminent writer on ancient Greece, was born at Brieg in Silesia, in 1797, and died in 1840.

MÜLLER, WILLIAM JAMES, English landscape and figure painter, was born at Bristol on June 28, 1812, and died there in 1845.

MULLET. This name is applied to two very different kinds of fishes, which are distinguished as Red Mulletts and Gray Mulletts. Red Mulletts (genus *Mullus*, the name given by the ancient Romans) are marine fishes. About forty different species of Red Mulletts are known, chiefly from the tropical and sub-tropical parts of the Indo-Pacific Ocean. In the Atlantic the species are much less numerous, the most celebrated being the European *Mullus barbatus*, which is abundant in the Mediterranean, and tolerably common on the coasts of England and Ireland.

MULLINGAR, a market-town of Ireland, capital of

Westmeath, is situated near the Brosna and on the Royal canal, forty-four miles west-by-north of Dublin.

MULREADY, WILLIAM, subject painter, was born at Ennis, County Clare, April 30, 1786. He died in 1863.

MULTÁN, or MOOLTAN, a district in the lieutenant-governorship of the Punjab, has an area of 5,880 square miles. Along the banks of the Chenáb, Sutlej, and Rávi extend fringes of cultivation varying in width from three to twenty miles, but the interior uplands have the same barren character as the district of MONTGOMERY, (*q.v.*) The census of 1901 returned the population at 551,964 persons.

MULTÁN, or MOOLTAN, city and headquarters of the above district, is situated four miles from the present left bank of the Chenáb. The total population in 1901 was 68,674. As a trade center Multán possesses great importance, its chief imports being cotton and other piece-goods, while the main staples of export are sugar, cotton, indigo, and wool.

MULTIPLEPOINDING is the technical term for a form of action in Scotch law by which conflicting claims to the same fund or property are determined.

MUMMY. The origin of mummification in Egypt has given rise to much learned conjecture (see EMBALMING), now, however, superseded by positive knowledge—a comparative study of sepulchral texts having furnished Egyptologists with convincing proof that the inviolate preservation of the body was deemed essential to the corporeal resurrection of the “justified” dead. The living man consists of a body, a soul, an intelligence, and an appearance or *eidolon*—in Egyptian, a *ka*. Death dissociated these four parts, which must ultimately be reunited for all eternity. Between death on earth and life everlasting there intervened, however, a period varying from 3,000 to 10,000 years, during which the intelligence wandered, luminous, through space, while the soul performed a painful probationary pilgrimage through the mysterious under-world. The body, in order that it should await, intact, the return of the soul whose habitation it was, must meanwhile be guarded from corruption and every danger. Hence, and hence only, the extraordinary measures taken to insure the preservation of the corpse and the inviolability of the sepulcher; hence the huge pyramid, the secret pit, and the subterranean labyrinth. The shadowy and impalpable *ka*—the mere aspect, be it remembered, of the man—was supposed to dwell in the tomb with the mummied body. This fragile conception was not, however, indestructible, like the soul and the intelligence. Being an aspect, it must perforce be the aspect of something material; and, if the body which it represents were destroyed or damaged, the *ka* was liable to the like mischance. In view of this danger, the Egyptian, by stocking his sepulcher with portrait statues, sought to provide the *ka* with other chances of continuance, these statues being designed, in a strictly literal sense, to serve as *supports* or dummies for the *ka*. The funeral portrait statues of the ancient empire (Dynasties I. to VI.) are marvels of realistic art in basalt, diorite, limestone, and wood. As many as twenty duplicates have been found in a single tomb, and always secreted in hidden chambers constructed in the thickness of the walls of the sepulcher. The Bulak Museum is very rich in *ka* statues of the ancient empire; and the British Museum contains two in wood from the tomb of Seti I., of the period of Dynasty XIX.

For the processes of mummification, as narrated by Greek and Latin authors, see EMBALMING. The details which follow are taken from original Egyptian sources.

The embalmment of a man of wealth, done in the costliest manner, consisted of—(1) the “going into the good

abode,” (2) the *Teb*, (3) the *Kesau*. The first of these was the process of evisceration, cleansing, etc., which occupied fifteen or sixteen days; the second was the salting or bituminizing, and took nineteen or twenty days; the third was the spicing and bandaging, and took thirty-four or thirty-five days—making seventy or seventy-two days in all. There were four special “rituals” for the guidance of the priestly operators and assistants—(1) that of “going into the good abode,” which was a kind of surgical manual for the use of the paraschists, enumerating the incisions to be made in the body; (2) that of “the *Kesau*,” a corresponding manual for the use of the taricheutes, containing lists of the necessary gums, resins, spices, etc., directions as to the number and nature of the bandages, and prayers to be repeated while adjusting them; (3) the “water-ritual” or service-book of litanies, to be recited during the transport of the mummy to the cemetery, which was almost always done by boat; (4) the funeral ritual, performed on consigning the mummy to the tomb. No copy of the first of these documents is known, but its substance is summarized in the Rhind papyrus. Of the other three, contemporary copies written on papyrus exist in various museums. Establishments for the reception and mummification of the dead were attached to all the great cemeteries. These mortuary suburbs, by the Greeks called “memnonia,” were inhabited by a large population of embalmers, mummy-case makers, gilders, painters, scribes, priests, and the like; and it has been calculated that from 500 to 800 corpses must always have been on hand in the workshops attached to the necropolis of Memphis. To prevent mistakes in delivering the mummies to their families, the bandagers were in the habit of marking the wrappings with the name and age of the deceased, sometimes adding the name and regnal year of the king in whose time he died. The ink in which these entries were written was made from nitrate of silver, like the marking-ink of the present day. The bandages were of linen only. The texture varied with the rank of the mummy, some being as fine as the finest India muslin, and some extremely coarse. The quantity used was enormous, and persons used to save their old linen for this purpose all their lives long. Each limb, finger, and toe was first separately swathed; and finally the whole body was enveloped in numberless convolutions, the contours of the shrunken form being skillfully restored by means of padding. From 700 to 1,250 yards of bandages, in strips of three to four inches wide, have been found on mummies.

The processes of mummification varied in different parts of Egypt and at different periods. The mummies made at Memphis are black, dry, and brittle, whereas those of the best Theban epoch are yellowish, flexible, and so elastic that the flesh yields to the touch of the finger and the limbs may be bent without breaking. Champollion-Figeac attributes this exquisite softness and elasticity to the injection of costly chemical liquids into the veins, whereby the substance of the flesh was preserved. The natron process, on the contrary, destroyed the flesh, leaving only the skin and the bones. By some schools of embalmers the cavity of the skull, after the withdrawal of the brain, was washed out by an injection of refined bitumen, the effect of which was to preserve the membranous covering which has frequently been found inside the brain-pan, dried and unimpaired. Hair is constantly found on the heads of mummies, sometimes plaited, sometimes frizzled—thus showing that the fashion of wearing wigs was by no means universal. The under bandages of mummies were laid on wet, having probably been dipped in spirits. They sometimes come off with the solidity of a pasteboard mask; and lifelike portraits of the dead

have been reproduced by simply casting plaster into these masks as into a mold. When Syrian turpentine came into use the Theban mummies ceased to maintain their supremacy, and became even blacker than those of Memphis, the corpse and its bandages forming one solid mass almost as hard as stone. In Memphite mummies, especially of the Ramesside and Saitic periods, the cavity of the chest is found filled with scarabæi and amulets in *pietra dura*. The Theban mummies, on the other hand, from Dynasty XI. to Dynasty XXIII., were adorned with rings, pectoral ornaments, collars, bracelets, etc., in exquisitely-wrought gold inlaid with lapis-lazuli, carnelian, green feldspar, and other precious stones. Under the Greeks and Romans the art of mummification declined. Rudely-painted wooden coffins were substituted for the granite sarcophagi and richly-decorated mummy-cases of former times. The mummies became ashen-gray, or, being boiled in bitumen, were black, heavy, and shapeless. Those of Græco-Roman times are frequently found wrapped in painted shrouds, and sometimes with coarsely-laued encaustic portraits on panel laid above the faces. Doctor Birch gives 700 A.D. as the date at which mummification practically ceased. It was formerly supposed that the bodies of the dead were merely desiccated under the ancient empire, and that actual embalming was not practiced before 2000 B.C. Recent explorations among the ruined pyramids of Sakkarah have, however, brought to light the mummified corpse of King Merenra, and part of the mummy of King Pepi, his father, both of Dynasty VI. Though denuded of its wrappings by ancient tomb-breakers, the mummy of Merenra is distinctly impressed in the usual manner with marks of its former bandages; and portions of the bandages and a "well-embalmed" hand were recovered from the *débris* of that of King Pepi. It is thus shown that mummification was an established rite toward the close of the ancient empire, and that the processes then in use were identical with those of later times, which compels us to ascribe a very early date (possibly 3800 or 4000 B.C.) to the beginnings of the art.

MUMPS (syn.) *Cyananche parotidea*, *parotitis*, also "The Branks," a contagious disease characterized by inflammatory swelling of the parotid and other salivary glands, frequently occurring as an epidemic, and affecting young persons. The disease generally sets in with symptoms of a cold or catarrh accompanied with slight febrile disturbance, but soon the nature of the ailment is announced by the occurrence of swelling and stiffening in the region of the parotid gland in front of the ear. The swelling speedily increases in size and spreads downward toward the neck and under the jaw, involving the numerous glands in that locality. The effect is to produce much disfigurement, which becomes still greater should the inflammation spread, as often happens, to the glands on the other side of the face and neck. Pain is present in the swollen parts, but it is seldom very severe, nor is there much redness or any tendency to suppuration. There is, however, considerable interference with the acts of mastication and swallowing. After continuing for four or five days the swelling and other symptoms abate, and the parts are soon restored to their normal condition. During the period of convalescence there occasionally occur some swelling and tenderness in other glands, such as the testicles in males, and the mammæ or ovaries in females, but these are of short duration and of no serious significance. That this complaint is highly contagious is shown by the readiness with which it spreads among children in schools, etc. The nature of the infecting agent is unknown, but the medium of communication is most probably the breath or secretions of the mouth.

Mumps is in general a mild disease, and requires but little treatment beyond a gentle laxative, the application of warm fomentations to the swollen and painful parts, and the use of soft food.

MÜNCHHAUSEN, **BARON**, the modern Philopseudes, "of whom Ferdinand Mendez Pinto was but a type," is commonly identified with Hieronymus Karl Friedrich von Münchhausen, of Bodenswerder, in Hanover, who, having entered the Russian service and served in several campaigns against the Turks, amused himself in his retirement by relating extraordinary instances of his prowess as soldier and sportsman. He died in 1797. In 1785 a little book of forty-eight pages, *Baron Münchhausen's Narrative of his Marvelous Travels and Campaigns in Russia*, was published in London. A second edition was printed at Oxford next year; an enlarged London edition speedily followed, and the book had gone through five editions before, in 1787, it was introduced to the German public in translation, with a preface by the poet Bürger.

MUNCIE, a city of the United States, county seat of Delaware county, Ind., fifty-four miles northeast of Indianapolis. It is a flourishing pleasant-looking place, with city hall, courthouse, public library, good railroad facilities, two national banks, some minor manufactures, and a population (1890) of 11,345.

MUNDAY, **ANTHONY**, was one of the most versatile miscellaneous writers of the Shakespearean age. In the introduction to his comedy, *John a Green and John a Cumber*, reprinted for the Shakespeare Society, Collier enumerates forty-seven works of which Munday was whole or part author, the subjects being very various—pastoral poems, journalistic tracts and pamphlets, translations of romances, plays, pageants. He was born in 1553, and died August 10, 1633.

MUNGO, **ST.** See **KENTIGERN**.

MUNGOOS, or **MONGOOS**. See **ICHNEUMON**.

MUNICH (in German, *München*), the capital of the kingdom of Bavaria and the fourth largest town in the German empire, is situated in an elevated and barren plain to the north of the Bavarian Alps. Owing to its lofty site (1,700 feet above the sea) and the proximity of the Alps the climate is rather changeable, and its mean annual temperature, 49° to 50° Fahr., is little higher than that of many places much farther to the north. The annual rainfall is stated at nearly thirty inches. The situation of Munich is devoid of physical advantages, and the surrounding district is no way remarkable for its wealth, but the construction of roads and railways has counterbalanced the lack of natural highways, while the central position of the town makes it easy of access from all parts of Europe.

Munich is divided into nineteen municipal districts, fourteen of which, including the old town, lie on the left bank of the small river Isar, while the suburban districts of Au, Haidhausen, Giesing, and Ramersdorf are on the opposite bank. The old town, still containing many narrow and irregular streets, forms a semicircle with its diameter toward the river, while round its periphery has sprung up the greater part of modern Munich, including the handsome Maximilian and Ludwig districts. The wall with which Munich was formerly surrounded has been pulled down, but some of the gates have been left standing. The most interesting of these is the Isar Thor, restored in 1835 and adorned with modern frescoes. The Sieges Thor or gate of victory is a modern imitation of the arch of Constantine at Rome, while the stately Propylæa is a reproduction of the gates of the Athenian Acropolis.

At the beginning of the present century Munich was in no way distinguishable from the crowd of second-rate German towns, but since the accession of Louis I.

in 1825 it has undergone a metamorphosis of the most remarkable character. This splendor-loving prince devoted himself heart and soul to the embellishment of his "residence," and his successors have followed in his footsteps with such zeal that Munich is now almost unrivaled for architectural magnificence among the smaller capitals of Europe, while its collections of art entitle it to rank alongside of Dresden and Berlin. Most of the modern buildings have been erected after celebrated prototypes of other countries and eras, so that, as has been said by Carrère, a walk through Munich affords a picture of the architecture and art of 2,000 years. The want of local coloring is perhaps a blemish in this "museum of architecture," and it has also been objected that the prevailing uniformity of surface in the buildings does not produce sufficient contrast of light and shade. In carrying out his plans Louis I. was ably seconded by the architect Klenze, while the external decorations of painting and sculpture were mainly designed by Cornelius, Kaulbach, and Schwanthaler.

The valuable collections of Munich, in virtue of which it ranks among the art-centers of Europe, are enshrined in handsome and appropriate buildings, most of them in the new Maximilian suburb on the north side of the town.

The scientific collections of Munich are on a par with its galleries of art.

At the head of the educational institutions of Munich stands the university, founded at Ingolstadt in 1472, removed to Landshut in 1800, and transferred thence to Munich in 1826. It has a staff of about 130 professors and lecturers, and in 1882 was attended by 2,183 students. In addition to the four usual faculties there is a fifth, of political economy. In connection with the university are medical and other schools, a priests' seminary, and a library of 200,000 volumes. The polytechnic institute, contained in a handsome brick edifice, adorned with medallions of celebrated architects, mathematicians, and naturalists, is also attended by a large number of students. Munich contains three gymnasia, a real-gymnasium, a military academy, a veterinary college, two industrial schools, a commercial school, a school for architects and builders, several normal schools, a conservatory of music, a dramatic training school, and about twenty-five elementary schools. Among the numerous benevolent institutions the most prominent are the asylums for the blind, the deaf and dumb, and the insane, and the general hospital. The general prison in the suburb of Au is considered a model of its kind; and a large military prison has just been erected. Among the other public buildings which call for mention are the crystal palace, 765 feet in length, erected for the great exhibition of 1854; the slaughter-houses, covering nine acres of ground; the Wittelsbach palace, in the Early English Pointed style; the post-office; the arsenal, containing a military museum; the new railway station, the art-industrial institution, the Maximilian barracks, the corn hall, and the aquarium. Among the numerous monuments with which the squares and streets are adorned, the most important are the colossal statue of Maximilian II. in the Maximilianstrasse, the equestrian statues of Louis I. and the elector Maximilian, and the obelisk erected to the 30,000 Bavarians who perished in Napoleon's expedition to Moscow.

Munich is well supplied with public parks. The population amounted at the census of December 1, 1900, to 499,959, an increase of 50,000 in ten years.

The commerce and manufactures of Munich are scarcely commensurate with its artistic importance, though it has lately begun to take rank among the great industrial centers.

MUNICIPALITY. A municipality is an organization for the self-government of a city or town by means of a corporation empowered generally to maintain peace and order, and to manage the affairs of the inhabitants. Such a corporation consists of a head as a mayor or provost, and of superior members as aldermen and councilors, together with the simple corporators who are represented by the governing body; it acts as a person by its common seal and has a perpetual succession with power to hold lands subject to the restrictions of the mortmain laws, and it can sue or be sued or be indicted, although there are of course many personal matters which do not come within the functions and liabilities of such bodies politic. Where necessary for its primary objects, every corporation has power to make by-laws and to enforce them by penalties, provided they are not unjust or unreasonable or otherwise inconsistent with the objects of the incorporation or charter or other instrument of foundation; and in the case of a municipality such by-laws will be binding even upon strangers within the district.

The municipalities of every country have a separate history of their own, and it is difficult to find any general law for determining their methods of development. According to their opportunities the oppressed wear out their conquerors' patience and too often become oppressors in their turn: as the state becomes more complex the old confederacies are broken up, and the scattered communities are reduced to order by a central government, and as privilege begins to disappear the towns are regulated by a common set of rules, or the whole country, as in France, is parceled out again into a new series of communes or corporate districts. In Spain, the needs of the state gave immediate freedom to its defenders. In Italy the cities grew too soon into a crowd of independent republics. The history of Lincoln and Exeter and the cities of the Danelagh shows that "the tendency of the great cities of England was toward a more than municipal independence." If these movements had not been checked by the Norman Conquest, English history might have been "like that of the imperial kingdoms." But, as this event turned out, there is little in the record of the German cities which bears upon that of English municipalities, excepting some slight resemblances between the powers acquired by the city of London and those of the Hanse towns and the mercantile principalities of Nuremberg and Augsburg. The free cities of Germany were at first divided between the emperors and their immediate vassals, the former ruling through the bishops as imperial vicars; in the twelfth century the citizens began to elect councils and to administer a concurrent jurisdiction; in the next century they either purchased full powers or drove out the vicars and bailiffs by force; the revolutions which followed the fall of the Hohenstaufen family enabled the cities to free themselves from the mediate lords and to hold directly of the empire, and they were soon afterward admitted to the diet on equal terms with the rest of its sovereign constituents.

The privileges of the cities in the United States illustrate the proposition that the history of every country must determine the type of its municipalities. In almost all parts of Europe the civic franchises arose out of some treaty or contract between the lord and his dependents; in France, however, the character of the corporations was gradually modified as the communal system was extended to the rural districts. In the United States the French model has been followed with the addition of many improvements, and where self-government has been impartially granted to the county, the township, and the village the purely municipal organization has lost its special significance. It

is regarded in the American courts as a revocable agency established by the State (without contract or consideration for the grant) for the purpose of carrying out the necessary details of civil government among the inhabitants of an urban district. It is considered to have no vested right to any of its powers or franchises, which are only allowed to exist in furtherance of the design for which the municipality was constituted, that object being the exercise in subordination to the legislature of certain minor powers of government over part of the territory of the State. Each city has the general powers of a corporation and no others, in the absence of special laws. It has executive functions and powers of legislation for civic purposes, which are vested in the mayor and his subordinate officers, but it is not in any other way intrusted with judicial authority.

MUNSTER. See IRELAND.

MÜNSTER, the chief town of the province of Westphalia, in Prussia, and formerly the capital of the important bishopric of its own name, lies in a sandy plain about half-way between Cologne and Bremen on the Aa, an insignificant affluent of the Ems. It is one of the best preserved old towns in Germany. Population (1901), 63,776.

MÜNSTER, SEBASTIAN, Hebraist, geographer, and mathematician, was born at Ingelheim, in the Palatinate, in 1489. From 1536 he taught at Basel, where he died of the plague on May 23, 1552.

MUNTJAK, one of the native names, now generally adopted in European languages, for a small group of Deer, the members of which are indigenous to the southern and eastern parts of Asia and the adjacent islands, and which are separated by very marked characteristics from all their allies. They are also called "Kijang" or "Kidjang," and constitute the genus *Cervulus* of Blainville and most zoölogists, *Syllocerus* of Hamilton Smith, and *Prox* of Ogilby.

The Muntjaks are solitary animals, very rarely even two being seen together. They are fond of hilly ground covered with forests, in the dense thickets of which they pass most of their time, only coming to the skirts of the woods at morning and evening to graze. They carry the head and neck low and the hind-quarters high, their action in running being peculiar and not very elegant, somewhat resembling the pace of a sheep, hence in southern India they bear the popular but erroneous name of "jungle sheep." Though with no power of sustained speed or extensive leap, they are remarkable for flexibility of body and facility of creeping through tangled underwood. Another popular name with Indian sportsmen is "barking deer," which is given on account of their alarm-cry, a kind of short, shrill bark, like that of a fox but louder, which may often be heard in the jungles they frequent both by day and by night. When attacked by dogs the males use their sharp, canine teeth with great vigor, inflicting upon their opponents deep and even dangerous wounds.

MÜNZER, THOMAS, was born of poor parents at Stolberg, in the Harz, in 1490, was educated at Halle and Leipsic, where he graduated in 1515, was a teacher in the Martini gymnasium in Brunswick in 1517, and was appointed in the beginning of 1520 preacher in the church of St. Mary at Zwickau. There he became the opponent of the friars on the one hand and of the humanist reformers on the other, while his eloquence, combined with his Christian socialism, gave him great power over the people. Wherever he went his Christian socialism was welcomed by the oppressed peasantry, who were encouraged to rise in the insurrection (Peasants' War) which ended so disastrously for them at Mühlhausen, 1525. After the battle Münzer was taken prisoner and executed.

MUNZINGER, WERNER, African traveler and linguist, was born at Olten, in Switzerland, April 4, 1832. In an expedition from Tadjura Bay to the kingdom of Shoa, Munzinger was killed, along with his wife and many of his companions, in an attack by a body of Gallas on November 14, 1875, in the neighborhood of Lake Assal.

MURÁDÁBÁD, or MORADABAD, a district in the lieutenant-governorship of the Northwestern Provinces of India. The area is 2,284 square miles. It lies within the great Gangetic plain, and is demarcated into three subdivisions by the rivers Rámangá and Sót. The district as a whole consists of a well-tilled and somewhat monotonous alluvial plain, unrelieved by any striking natural features.

The census of 1901 returned the population of the district, exclusive of non-Asiatics, at 1,355,173. Murádábád contains five municipal towns, viz.: Murádábád, 75,176; Amroha, 36,145; Sambhal, 35,196; Chaudasi, 27,521; Dhanaura, 5,204.

MURÁDÁBÁD, town and headquarters of the above district, is situated on the right bank of the Rámangá river, with a population in 1901 of 75,176.

MURÆNA is the name of an eel common in the Mediterranean, and highly esteemed by the ancient Romans; it was afterward applied to the whole genus of fishes to which the Mediterranean species belongs, and which is abundantly represented in tropical and sub-tropical seas, especially in rocky parts or on coral reefs. Some ninety species are known.

Some of the tropical Murænas exceed a length of ten feet, but most of the species, among them the Mediterranean species, attain to only half that length.

MURAL DECORATION. There is scarcely one of the numerous branches of decorative art which has not at some time or other been applied to the ornamenting of wall-surfaces. It will be convenient to classify the various methods under different heads.

1. *Relief sculptured in Marble or Stone.*—This is the oldest method of wall-decoration, of which numerous examples still exist. The tombs and temples of Egypt are very rich in this kind of mural ornament of various dates, extending over the enormous period of nearly 5,000 years. These sculptures are, as a rule, carved in very low relief; in many cases they are "countersunk," that is, the most projecting parts of the figures do not extend beyond the flat surface of the ground. Some unfinished reliefs discovered in the rock-cut tombs of Thebes show the manner in which the sculptor set to work. The plain surface of the stone was marked out by red lines into a number of squares of equal size. The use of this was probably twofold: first, as a guide in enlarging the design from a small drawing, a method still commonly practiced; second, to help the artist to draw his figures with just proportions, following the very strict canons which were laid down by the Egyptians. No excessive realism or individuality of style arising from a careful study of the life-model was permitted. When the surface had been covered with these squares, the artist drew with a brush dipped in red the outlines of his relief, and then cut round them with his chisel.

When the relief was finished, it was, as a rule, entirely painted over, with much minuteness and great variety of colors. More rarely the ground was left the natural tint of the stone or marble, and only the figures and hieroglyphs painted. In the case of sculpture in hard basalt or granite the painting appears often to have been omitted altogether. The utter absence of perspective effects and the severe self-restraint of the sculptors in the matter of composition show a keen sense of artistic fitness in this kind of decoration. That the

stern rigidity of these sculptured pictures did not in any way arise from want of skill or observation of nature on the part of the artists is at once apparent when we examine their representations of birds and animals; with the most unerring skill and precision the special characteristics of each creature and species were caught by the ancient Egyptian and reproduced in stone or color, not literally, but in a half-symbolic way, suggesting exactly those peculiarities of form, plumage, or movement which are the essence and "differentia" of each, all other ideas bearing less directly on the point being carefully eliminated.

The subjects of these great mural sculptures are endless in their variety; almost every possible incident in man's life here or beyond the grave is reproduced with the closest attention to detail.

The above remarks as to style and manner of execution may be applied also to the wall-sculptures from the royal palaces of Nineveh and Babylon, the finest of which are shown by inscriptions to date from the time of Sennacherib to that of Sardanapalus, (from 705 to 625 B.C.) Very remarkable technical skill is shown in all these sculptures by the way in which the sculptors have obtained the utmost amount of effect with the smallest possible amount of relief, in this respect calling strongly to mind a similar peculiarity in the work of the Florentine Donatello.

Of a widely different class, but of considerable importance in the history of mural decoration, are the very beautiful reliefs, sculptured in stone and marble, with which Moslem buildings in many parts of the world are ornamented. These are mostly geometrical patterns of great intricacy and beauty, which cover large surfaces, frequently broken up into panels by bands of more flowing ornament of Arabic inscriptions. The mosques of Cairo, India, and Persia and the domestic Moslem buildings of Spain are extremely rich in this magnificent method of decoration. In western Europe, especially during the fifteenth century, stone paneled-work with rich tracery formed a large part of the scheme of decoration in all the more splendid buildings. Akin to this, though without actual relief, is the very sumptuous stone tracery—inlaid flush into rough flint walls—which was a mode of ornament largely used for enriching the exteriors of churches in the counties of Norfolk and Suffolk. It is almost peculiar to that district, and is an admirable example of the skill and taste with which the mediæval builders adapted their method of ornamentation to the materials which came naturally to hand.

2. *Marble Veneer*.—Another widely-used method of mural decoration has been the application of thin marble linings to wall-surfaces, the decorative effect being produced by the natural beauty of the marble itself and not by sculptured reliefs. One of the oldest buildings in the world, the so-called "Temple of the Sphinx" among the Gizeh pyramids, is built of great blocks of granite, the inside of the rooms being lined with slabs of beautiful semi-transparent African ababaster about three inches thick. In the first century very thin veneers of richly-colored marbles were largely used by the Romans to decorate brick and stone walls. Pliny speaks of this practice as being a new and degenerate invention in his time. Many examples exist at Pompeii and in other Roman buildings. Numerous Byzantine churches, such as St. Saviour's at Constantinople, and St. George's, Thessalonica, have the lower part of the internal walls richly ornamented in this way.

3. *Wall-Linings of Glazed Bricks or Tiles*.—This is a very important class of decoration, and from its almost imperishable nature, its richness of color, and its brill-

iance of surface is capable of producing a splendor of effect that can only be rivaled by glass mosaics. In the less important form—that of bricks modeled or stamped in relief with figures and inscriptions, and then coated with a brilliant color in silicious enamel—it was largely used by the ancient Egyptians and Assyrians as well as by the later Sasanians of Persia. In the eleventh and twelfth centuries the Moslems of Persia brought this art to great perfection, and used it on a large scale, chiefly, though not invariably, for internal walls. The main surfaces were covered by thick earthenware tiles, overlaid with a white enamel. These were not rectangular, but of various shapes, mostly some form of a star, arranged so as to fit closely together. Very delicate and minute patterns were then painted on the tiles, after the first firing, in a copper-like color with strong metallic luster, produced by the deoxidization of a metallic salt in the process of the second firing. Bands and friezes with Arabic inscriptions, modeled boldly in high relief, were used to break up the monotony of the surface. In these, as a rule, the projecting letters were painted blue, and the flat ground enriched with very minute patterns in the luster-color. This combination of bold relief and delicate painting produces great vigor and richness of effect, equally telling whether viewed in the mass or closely examined tile by tile. In the fifteenth century luster-colors, though still largely employed for plates, vases, and other vessels, especially in Spain, were but little used for tiles; and another class of ware, rich in the variety and brilliance of its colors, was extensively used by Moslem builders all over the Mohammedan world. The most sumptuous sorts of tiles used for wall-coverings are those of the so-called "Rhodian" and Damascus wares, the work of Persian potters at many places. Those made at Rhodes are coarsely executed in comparison with produce of the older potteries at Ispahan and Damascus (see POTTERY). These are rectangular tiles of earthenware, covered with a white "slip" and painted in the most brilliant colors with slightly conventionalized representations of various flowers, especially the rose, the hyacinth, and the carnation. The red used is a very rich harmonious color, applied in considerable body, so as to stand out in slight relief. Another class of design is more geometrical, forming regular repeats; but the most beautiful compositions are those in which the natural growth of trees and flowers is imitated, the branches and blossoms spreading freely over a large surface covered by hundreds of tiles without any repetition. One of the finest examples is the "Mecca wall" in the mosque of Ibrâhîm Agha, Cairo; and other Egyptian mosques are adorned in the same magnificent way.

Another important class of wall-tiles are those manufactured by the Spanish Moors, called "azulejos," especially during the fourteenth century. These are in a very different style, being designed to suggest or imitate mosaic. They have intricate interlacing geometrical patterns marked out by lines in slight relief; brilliant enamel colors were then burned into the tile, the projecting lines forming boundaries for the pigments. A very rich effect is produced by this combination of relief and color. They are mainly used for dados about four feet high, often surmounted by a band of tiles with painted inscriptions. The Alhambra and Generalife palaces at Granada, begun in the thirteenth century, but mainly built and decorated by Yûsuf I. and Mohammed V. (1333-1391 A.D.), and the Alcazar at Seville have the most beautiful examples of these "azulejos."

Almost peculiar to Spain are a variety of wall-tile, the work of Italians in the sixteenth and seventeenth centuries. These are effective, though rather coarsely painted, and have a rich yellow as the predominant color.

4. *Wall-Coverings of Hard Stucco, frequently enriched with Reliefs.*—The Greeks and Romans possessed the secret of making a very beautiful hard kind of stucco, creamy in color, and capable of receiving a polish like that of marble; it would stand exposure to the weather. Those of the early Greek temples which were built, not of marble, but of stone, such as the Doric temples at Ægina, Phigaleia, Pæstum, and Agrigentum, were all entirely coated inside and out with this beautiful material—itsself pleasant in both texture and hue, and an admirable surface for the further polychromatic decoration with which all Greek buildings seem to have been ornamented. Another highly artistic use of stucco among the Greeks and Romans for the interiors of buildings consisted in covering the walls and vaults with a smooth coat, on which, while still wet, the outlines of figures, groups, and other ornaments were sketched with a point; more stucco was then applied in lumps and rapidly modeled into delicate reliefs before it had time to set. Some tombs in Magna Græcia of the fourth century B.C. are decorated in this way with figures of nymphs, cupids, animals, and wreaths, all of which are models of grace and elegance, both in form and action, and extremely remarkable for the dexterous way in which a few rapid touches of the modeling tool or thumb have produced a work of the highest artistic beauty and spirit.

The Moslem architects of the Middle Ages, who excelled in almost all possible methods of mural decoration, made great use of stucco ornament in the most elaborate and magnificent way, for both external and internal walls. The stucco is modeled in high or low relief in great variety of geometrical patterns, of wonderful beauty and richness, alternating with bands of more flowing ornament, or long Arabic inscriptions.

During the sixteenth century, and even earlier, stucco wall-reliefs were used with considerable skill and decorative effect in Italy, England, and other Western countries.

5. *Sgraffito.*—This is a variety of stucco work used chiefly in Italy from the sixteenth century downward, and employed only for exteriors of buildings, especially the palaces of Tuscany and northern Italy. The process is this:—The wall is covered with a coat of stucco made black by an admixture of charcoal; over this a second very thin coat of white stucco is laid. When it is all hard the design is produced by cutting and scratching away the white skin, so as to show the black undercoat. Thus the drawing appears in black on a white ground.

6. *Stamped Leather.*—This was a very magnificent and expensive form of wall-hanging, chiefly used during the sixteenth and seventeenth centuries. Skins, generally of goats or calves, were well tanned and cut into rectangular shapes. They were then covered with silver leaf, which was varnished with a transparent lacquer, making the silver look like gold. The skins were then stamped or embossed with patterns in relief, formed by heavy pressure from metal dies, one in relief and the other sunk. The reliefs were then painted by hand in many colors, generally brilliant in tone. Italy and Spain (especially Cordova) were important seats of this manufacture; and in the seventeenth century a large quantity was produced in France.

7. *Painted Cloth.*—Another form of wall-hanging, used most largely during the fifteenth and sixteenth centuries, and in a less extensive way a good deal earlier, is canvas painted to imitate tapestry.

Many good artists working at Ghent and Bruges during the first half of the fifteenth century produced very fine work of this class, as well as designs for real tapestry. Several of the great Italian artists devoted their

utmost skill in composition and invention to the painting of these wall hangings.

8. *Printed Hangings and Wall-Papers.*—The printing of various textiles with dye colors and mordants is probably one of the most ancient of the arts. Pliny clearly describes a dyeing process employed by the ancient Egyptians, in which the pattern was probably formed by printing from blocks. Various methods have been used for this work—wood blocks in relief, engraved metal plates, stencil plates, and even hand-painting; frequently two or more of these methods have been employed for the same pattern. The use of printed stuffs is of great antiquity among the Hindus and Chinese, and was certainly practiced in western Europe in the thirteenth century, and perhaps earlier.

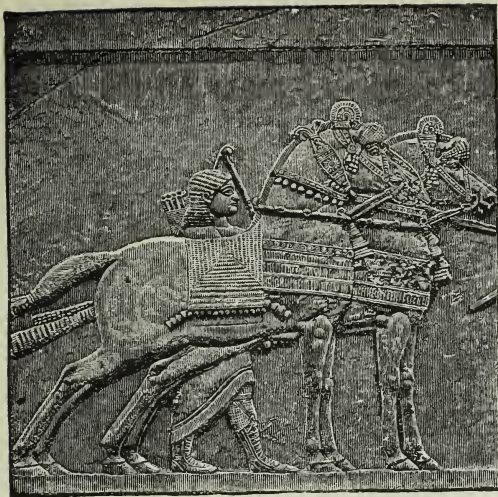
Wall-papers did not come into common use in Europe till the eighteenth century, though they appear to have been used much earlier by the Chinese. A few rare examples exist in England which may be as early as the sixteenth century; these are imitations, generally in flock, of the fine old Florentine and Genoese cut velvets, and hence the style of the design in no way shows the date of the wall-paper, the same traditional patterns being reproduced for many years with little or no change. Machinery enabling paper to be made in long strips was not invented till the end of the last century, and up to that time wall-papers were printed on small square pieces of hand-made paper, difficult to hang, disfigured by numerous joints, and comparatively costly. On these accounts wall-papers were slow in superseding the older and more magnificent modes of mural decoration, such as wood-paneling, painting, tapestry, stamped leather, and painted cloth.

Though at first wall-papers were a mere makeshift and feeble imitation of rich textiles, yet, with a good feeling for the harmonies of color and a regard for the technical necessities of the process, very rich and beautiful effects may be produced at a comparatively small cost if hand-printing be adopted. Imitations of stamped leather are now produced with great success, though of inferior durability. Very thick, tough paper is used for this, and treated in the same way as the real skins mentioned above.

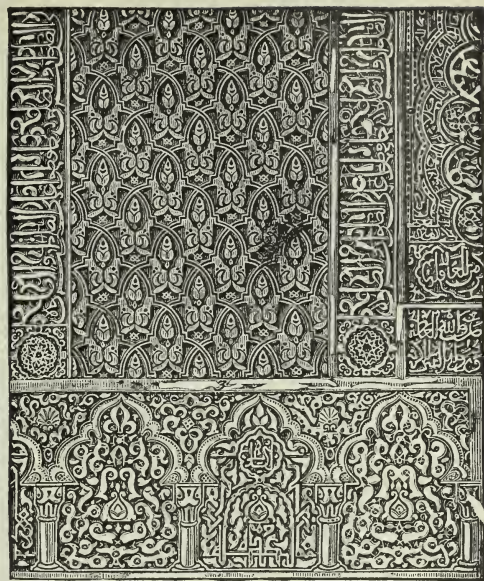
PAINTING.

This is naturally the most important and the most widely used of all forms of wall-decoration, as well as perhaps the earliest.

Egyptian Paintings.—Egypt is the chief storehouse of ancient specimens of this, as of almost all the arts. Owing to the intimate connection between the sculpture and painting of early times, the remarks above, both as to subjects and treatment under the head of Egyptian wall-sculpture, will to a great extent apply also to the paintings. It is a very important fact, and one which testifies clearly to the enormous antiquity of Egyptian civilization, that the earliest paintings, dating more than 4,000 years before our era, are also the cleverest in both drawing and execution. In later times the influence of Egyptian art, especially in painting, was very important among even very distant nations. In the sixth century B.C. Egyptian colonists, introduced by Cambyse into Persopolis, largely influenced the painting and sculpture of the great Persian empire and throughout the valley of the Euphrates. In a lesser degree the art of Babylon and Nineveh had felt considerable Egyptian influence several centuries earlier. The same influence affected the early art of the Greeks and the Etrurians, and it was not till the middle of the fifth century B.C. that the further development and perfecting of art in Greece obliterated the old traces of Egyptian mannerism. After the death of Alexander the Great, when Egypt



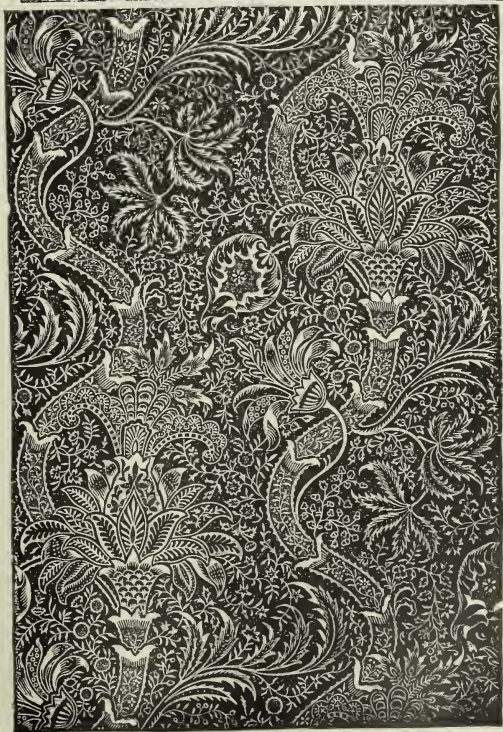
1



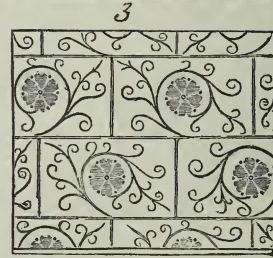
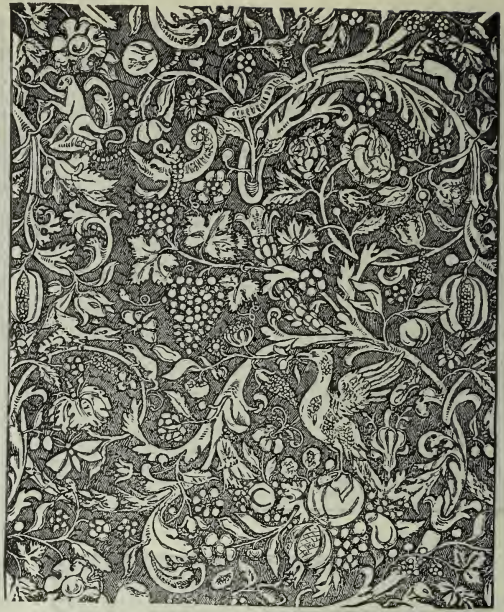
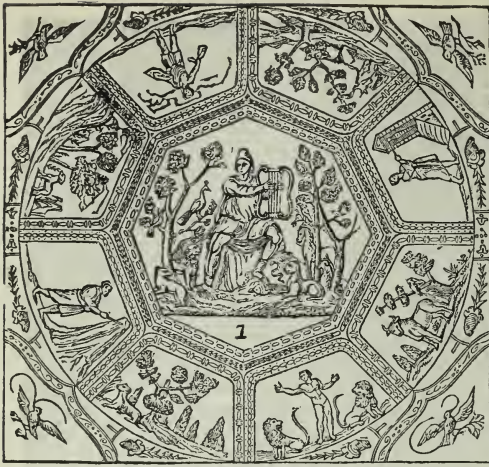
2



4



1.—Assyrian Relief, from Palace of Sardanapalus at Nineveh; 2.—Ariadne and Dionysus, from ruins of Pompeii; 3.—Stucco from the Alhambra; 4.—Egyptian wall painting; 5.—Early 18th century wall paper.



1.—Painted Vault, from Catacombs of St. Calixtus at Rome; 2.—Fifteenth century English painting of St. John the Evangelist; 3.—Italian stamped leather of 16th century; 4.—Wall-painting of 13th century; 5.—Stucco wall-relief from Grecian tomb; half size.

came into the possession of the Lagidæ (320 B.C.), the tide of influence flowed the other way, and Greek art modified though it did not seriously alter the characteristics of Egyptian painting and sculpture, which still retained much of their early formalism and severity. And yet the increased sense of beauty, especially in the human face, derived from the Greeks, was counterbalanced by loss of vigor and force; art under the Ptolemies ceased to have a real life and became a mere dull copyism of earlier traditions.

The general scheme of mural painting in the buildings of ancient Egypt was very complete and magnificent. Columns, moldings, and other architectural features were enriched with patterns in brilliant colors; the flat wall-spaces were covered with figure-subjects, generally in horizontal bands, and the ceilings were richly ornamented with sacred symbols, such as the vulture, or painted blue and studded with gold stars to symbolize the sky. The wall-paintings are executed in tempera on a thin skin of fine lime, laid over the brick, stone, or marble to form a smooth and slightly absorbent coat to receive the pigments, which were most brilliant in tone and of great variety of tint. Not employing fresco, the Egyptian artists were not restricted to "earth colors," but occasionally used purples, pinks, and greens which would have been destroyed by fresh lime. The blue used is a very beautiful color, and is generally laid on in considerable body—it is frequently a "smalt" or deep blue glass, colored by copper oxide, finely powdered. Red and yellow ochre, carbon-black, and powdered chalk-white are most largely used.

Etruscan Painting.—The rock-cut sepulchres of the Etrurians supply the only existing specimens of their mural painting; and, unlike the tombs of Egypt, only a small proportion appear to have been decorated in this way. The actual dates of these paintings are very uncertain, but they range possibly from about the eighth century B.C. down to almost the Christian era. The tombs which possess these paintings are mostly square-shaped rooms, with slightly arched or gabled roofs, excavated in soft sandstone or tufa hillsides. The earlier ones show distinct Egyptian influence alike in drawing and in composition: they are very broadly designed with flat unshaded tints, the faces in profile, except the eyes, which are drawn as if seen in front. Colors, as in Egypt, are used conventionally—male flesh red, white or pale yellow for the females, black for demons. In one respect these paintings differ from those of the Egyptians; very few colors are used—red, brown, and yellow ochers, carbon-black, lime or chalk-white, and occasionally blue are the only pigments.

Greek Painting.—This is a very obscure subject, for, although Strabo, Pliny, Pausanias, and others have left us minute descriptions of Greek paintings and ample accounts of painters and styles, yet of the pictures themselves almost nothing now remains. Even in Egypt the use of color does not appear to have been more universal than it was among the Greeks, who applied it freely to their marble statues and reliefs, the whole of their buildings inside and out, as well as for the decoration of flat wall-surfaces. They appear to have cared but little for pure form, and not to have valued the delicate ivory-like tint and beautiful texture of their fine Pentelic and Parian marbles, except as a ground for colored ornament. A whole class of artists were occupied in coloring marble sculpture, and their services were very highly valued. In some cases, probably for the sake of hiding the joints and getting a more absorbent surface, the marble, however pure and fine in texture, was covered with a thin skin of stucco made of mixed lime and powdered marble. Among the extremely rare specimens of Greek painting still

existing, the most important is an alabaster sarcophagus, found in a tomb near Corneto, and now in the Etruscan museum at Florence. This is decorated outside with very beautiful and purely Greek paintings, executed on a stucco skin as hard and smooth as the alabaster itself. The pictures represent combats of the Greeks and Amazons, drawn with marvelous beauty of outline and grace of movement and composition. The coloring, though rather brilliant, is very simply treated, and the figures are kept strictly to one plane without any attempt at complicated perspective. Other most valuable specimens of Greek art, found at Herculaneum and now in the Naples museum, are some small paintings, one of the girls playing with dice, and another of Theseus and the Minotaur. These are painted with miniature-like delicacy on the bare surface of marble slabs; they are almost monochromatic, and are of the highest beauty both in drawing and in their skillfully-modeled gradations of shadow—quite unlike any of the Greek vase-paintings.

Greek mural painting, like their sculpture, was chiefly used to decorate temples and public buildings, and comparatively rarely for either tombs or private buildings—at least in the days of their early republican simplicity. They were in the true sense of the word works of monumental art, and were no doubt designed and executed with that strict self-restraint and due subordination to their architectural surroundings which we see so strongly marked in all Greek sculpture of the best periods.

Roman Painting.—A very large number of Roman mural paintings now exist, of which by far the greatest quantity was discovered in the private houses and baths of Pompeii, nearly all dating between 63 A.D., when the city was ruined by an earthquake, and 79 A.D., when it was buried by Vesuvius. A catalogue of these and similar paintings from Herculaneum and Stabiae, compiled by Professor Helbig, comprises 1,966 specimens. The excavations in the baths of Titus and other ancient buildings in Rome, made in the early part of the sixteenth century, excited the keenest interest and admiration among the painters of that time, and very largely influenced the later art of the Renaissance. These paintings, especially the "grotesques" or fanciful patterns of scroll-work and pilasters mixed with semi-realistic foliage and figures of boys, animals, and birds, designed with great freedom of touch and inventive power, seem to have thoroughly fascinated Raphael during his later period, and many of his pupils and contemporaries. The "loggie" of the Vatican and of the Farnesina palace are full of carefully-studied sixteenth-century reproductions of these highly-decorative paintings. Of late years the excavations on the Palatine and in the garden of the Farnesina in Rome have brought to light some mural paintings of the first century of our era, perhaps superior in execution even to the best of the Pompeian series.

The range of subjects found in Roman mural paintings is very large—mythology, religious ceremonies, genre, still life, and even landscape (the latter generally on a small scale, and treated in an artificial and purely decorative way), and lastly history. Pliny mentions several large and important historical paintings, such as those with which Valerius Maximus Messala decorated the walls of the Curia Hostilia, to commemorate his own victory over Hiero II. and the Carthaginians in Sicily in the third century B.C.

Early Christian Mural Paintings in Italy.—A very interesting series of these exists in various catacombs, especially those of Rome and Naples. They are of great value, both as an important link in the history of art and also as throwing considerable light on

the mental state of the early Christians, which was distinctly influenced by the older faith. Thus in the earlier paintings of about the fourth century we find Christ represented as a beardless youth, beautiful as the artist could make him, with a lingering tradition of Greek idealization, in no degree like the "Man of Sorrows" of mediæval painters, but rather a kind of genius of Christianity in whose fair outward form the peace and purity of the new faith were visibly symbolized, just as certain distinct attributes were typified in the persons of the gods of ancient Greece. The paintings of the fifth and sixth centuries still follow the classical lines, though in a rapidly deteriorating style, until the introduction of a foreign—the Byzantine—element, which created a fresh starting-point on quite different lines. The old naturalism and survival of classical freedom of drawing is replaced by stiff, conventionally hieratic types, very superior in dignity and strength to the feeble and spiritless compositions produced by the extreme degradation into which the native art of Rome had fallen. The designs of this second period of Christian art are very similar to those of the mosaics, such as many at Ravenna, and also to the magnificently illuminated MSS., on which the utmost skill and labor of the time were lavished. For some centuries there was but little change or development in this Byzantine style of art, so that it is impossible in most cases to be sure from mere internal evidence of the date of any painting. This to some extent applies also to the works of the earlier or pagan school, though, roughly speaking, it may be said that the least meritorious pictures are the latest in date.

It was not, in fact, till the second half of the thirteenth century that stiff traditional Byzantine forms and coloring began to be superseded by the revival of native art in Italy, by the painters of Florence, Pisa, and Siena (see *FRESCO*). During the first thirteen centuries of the Christian era mural painting appears to have been for the most part confined to the representation of sacred subjects. It is remarkable that during the earlier centuries, council after council of the Christian church forbade the painting of figure-subjects, and especially those of any person of the Trinity; but it was quite in vain. The double desire, both for the artistic effect of painted walls and for the religious teaching afforded by the pictorial representation of sacred scenes and the celebration of the sacraments, was too strong. In spite of the zeal of bishops and others, who sometimes with their own hands defaced the pictures of Christ on the walls of the churches, in spite of threats of excommunication, the forbidden paintings by degrees became more numerous, till the walls of almost every church throughout Christendom were decorated with whole series of pictured stories. The useless prohibition was becoming obsolete when, toward the end of the fourth century, the learned Paulinus, bishop of Nola, ordered the two basilicas which he had built at Fondi and Nola to be adorned with wall-paintings of sacred subjects, with the special object, as he says, of instructing and refining the ignorant and drunken people. These painted histories were in fact the books of the unlearned, and we can now hardly realize their value and importance as the chief mode of religious teaching in ages when none but the clergy could read or write.

English Mural Painting.—During the Middle Ages, just as long before among the ancient Greeks, colored decoration was used in the widest possible manner, not only for the adornment of flat walls, but also for the enrichment of sculpture and all the fittings and architectural features of buildings, whether the material to be painted was plaster, stone, marble, or wood. It was only the damp and frosts of northern climates that

to some extent limited the external use of color to the less exposed parts of the outsides of buildings. The varying tints and texture of smoothly-worked stone appear to have given no pleasure to the mediæval eye; and in the rare cases in which the poverty of some country church prevented its walls from being adorned with painted ornaments or pictures the whole surface of the stone-work inside, moldings, and carving as well as flat wall-spaces, was covered with a thin coat of whitewash. Internal rough stone-work was invariably concealed by stucco, forming a smooth ground for possible future paintings. Unhappily the ignorant barbarity of the nineteenth century has in the case of most English cathedrals and parish churches stripped off the internal plaster, often laying bare rubble walls of the roughest description, never meant to be exposed, and has scraped and rubbed the surface of the masonry and moldings down to the bare stone. In this way a great proportion of mural paintings have been destroyed, though many in a more or less limited state still exist in England. It is difficult (and doubly so since the so-called "restoration" of most old buildings) to realize the splendor of effect once possessed by every important mediæval church. From the tiled floor to the roof all was one mass of gold and color. The brilliance of the mural paintings and richly-colored sculpture and moldings was in harmony with the splendor of the oak-work—screens, stalls, and roofs—all richly decorated with gilding and painting, while the light, passing through stained glass, softened and helped to combine the whole into one even mass of extreme decorative effect. Color, and not in dull tints, was boldly applied everywhere, and thus the patchy effect was avoided which is so often the result of modern timid and partial use of painted ornament. Even the figure-sculpture was painted in a strong and realistic manner, sometimes by a waxencaustic process, probably the same as the *circumlitio* of classical times. In the accounts for expenses in decorating Orvieto cathedral wax is a frequent item among the materials used for painting. In one place it is specially mentioned that wax was supplied to Andrea Pisano (in 1345) for the decoration of the beautiful reliefs in white marble on the lower part of the west front.

Mural painting in England fell into disuse in the sixteenth century. For domestic purposes wood-paneling, stamped leather, and tapestry were chiefly used as wall-coverings. In the reign of Henry VIII., probably in part through Holbein's influence, a rather coarse sort of tempera wall-painting, German in style, appears to have been common.

MURANO, the ancient Ammariuno, an island in the Venetian lagoon about one mile north of Venice, is five miles in circumference, a large part of which is occupied by gardens. It contains about 4,000 inhabitants, but was once much more populous than it is at present, its inhabitants numbering 30,000. It was a favorite resort of the Venetian nobility before they began to build their villas on the mainland; and in the fifteenth and sixteenth centuries its gardens and casinos, of which some traces still remain, were famous. It was here that the literary clubs of the Vigilanti, the Studiosi, the Occulti, used to meet.

MURAT, JOACHIM, king of Naples and a celebrated French cavalry leader, was, according to most accounts, the younger son of an innkeeper at Bastide Fortunière, in the department of Lot, France, and was born in 1768, but by his own account his father was a well-to-do farmer in that village. This is most probably the truth. In November, 1791, he was elected by the department of Lot a member of the *garde constitutionnelle* of the king. In May, 1792, the *garde* was disbanded. When Bonaparte was requested by Barras

to undertake the defense of the convention in Vendémiaire, 1795, he at once called Murat to his side and commissioned him to bring up from Sèvres the artillery with which the sections were shot down. In the first battles of the famous campaign of 1796, Montenotte, Ceva, Dego, and Mondovi, Murat so greatly distinguished himself that he was chosen to carry the flags taken from the enemy to Paris.

In 1798 he was for a short time commandant at Rome, and then accompanied Bonaparte to Egypt. At the battle of the Pyramids he led his first famous cavalry charge, and so distinguished himself in Syria that he was made general of division. He returned to France with Bonaparte, and on the 18th Brumaire led into the orangery of Saint Cloud the sixty grenadiers whose appearance broke up the Council of Five Hundred. He was, after the success of the *coup d'état*, made commandant of the consular guard, and in January, 1800, married Marie Annonciade Caroline Bonaparte, the youngest sister of the first consul. He commanded the French cavalry at the battle of Marengo, and was afterward made governor in the Cisalpine Republic. He was made a marshal of France in 1804; he was titular governor of Paris, was invested with the grand eagle of the Legion of Honor, and appointed grand admiral of France with the title of prince in 1805. He commanded the cavalry of the grand army in the German campaign of 1805, and was so conspicuous at Austerlitz that Napoleon made him grand-duke of Berg and Cleves. He commanded the cavalry at Jena, Eylau, and Friedland, and in 1808 was made general-in-chief of the French armies in Spain. He entered Madrid on March 25, and did much to hurry on the Spanish policy of Napoleon. The inhabitants of Madrid showed their hatred for the French by murdering, on May 2d, all the isolated or wounded Frenchmen they could find. Murat vigorously put down the riot, but not cruelly, for only 158 Spaniards fell to 500 Frenchmen; and he hoped for the throne of Spain as his reward. But the throne of Spain was given to Joseph Bonaparte, and Murat received Joseph's former kingdom of Naples.

King Joachim Napoleon, as he called himself, entered Naples in September, 1808, and soon won great popularity by his handsome presence and his gayety of manner. He took Capri from the English, and organized a Neapolitan army of 80,000 infantry and 10,000 cavalry. But his attention was not confined to military matters; he effected other great reforms in finally abolishing all relics of feudalism and putting down brigandism. Unfortunately much injustice was done by General Manhès in this last reform, which seriously affected Murat's popularity in Calabria. He was not present at Aspern or Wagram, but once more commanded the cavalry of the grand army in the Russian campaign of 1812. He manifested his usual headlong valor in the disastrous retreat, but, being offended by Napoleon, he suddenly threw up his command and left for Naples. He then began an intrigue with Austria. Whether it was that he hoped to escape from a doubtful cause or that he was really offended by Napoleon's preference for Eugène Beauharnais is not known, but in March, 1813, he sent Prince Cariati to Vienna to declare that he would surrender his claims to Sicily if Austria would guarantee Naples to him. In January, 1814, the alliance with Austria was declared by Murat's seizing the principality of Benevento, while Austria promised him Ancona for a force of 30,000 men. At the congress of Vienna his independence was attacked by Talleyrand, who was his personal enemy, and it was as much from distrust of Austria as anything else that he declared in March, 1815, that he intended to restore the unity and independence of Italy. He had hoped

that Lord William Bentinck, the English general, would have supported him, but in vain. The Austrians steadily advanced, and on May 2d he suffered a disastrous defeat at the battle of Tolentino. With difficulty he escaped, and reached France on May 27th. He offered his sword to Napoleon, who indignantly refused his offer, and he then hid in seclusion near Toulon with a price upon his head. After Waterloo he was refused an asylum in England, and went to Corsica, where he was joined by a few rash spirits, who urged him to strike another blow for his kingdom of Naples. He refused an offer of asylum from Metternich, and started with six ships. By a great mistake he landed in Calabria, where he was hated for the cruelty of Manhès, on October 6th; his ships deserted him, and he was taken prisoner by a captain named Trenta-Capilli, whose brother had been executed by Manhès. He was imprisoned in the fort of Pizzo, and on October 13, 1815, was tried by court-martial, under a law of his own, for disturbing the public peace and was sentenced to be shot in half an hour. After writing a touching letter of farewell to his wife and children, he bravely met his fate, and was buried at Pizzo.

MURATORI, LUDOVICO ANTONIO, a learned Italian scholar, historian, and antiquary, was born at Vignola, in the duchy of Modena, October 21, 1672, and died in 1750.

MURCHISON, SIR RODERICK IMPEY, geologist, was born at Tarradale, in Eastern Ross-shire, Scotland, February 19, 1792. Young Murchison left the Highlands when only three years old, and at the age of seven was sent to the grammar school of Durham, where during six years he received the only connected general education he ever obtained. He was then placed at the military college, Great Marlow, to be trained for the army. With some difficulty he succeeded in passing the not very stringent examinations of the time, and at the age of fifteen was gazetted ensign in the Thirty-sixth regiment. A year later (1808) he landed with Wellesley in Galicia, and was present at the actions of Rorica and Vimiera. Subsequently under Sir John Moore he took part in the retreat to Coruña and the final battle there.

Returning to England in 1818, he sold his paternal property in Ross-shire and settled in England, where he joined the Geological Society of London, and soon showed himself one of its most active members, having as his colleagues there such men as Sedgwick, Lyell, Buckland, Herschel, Whewell, and Babbage.

Turning his attention for a little to Continental geology, he explored with Lyell the volcanic region of Auvergne, parts of southern France, northern Italy, Tyrol, and Switzerland. A little later, with Sedgwick as his companion, he attacked the difficult problem of the geological structure of the Alps, and their joint paper giving the results of their study will always be regarded as one of the classics in the literature of Alpine geology.

It was in the year 1831 that Murchison found the field in which the chiefwork of his life was to be accomplished. Acting on a suggestion made to him by Buckland, he betook himself to the borders of Wales, with the view of endeavoring to discover whether the graywacke rocks underlying the Old Red Sandstone could be grouped into a definite order of succession as the Secondary rocks of England had been made to tell their story by William Smith. For several years he continued to work vigorously in that region. The result was the establishment of the Silurian system—a definite section of the geological record.

The establishment of the Silurian system was followed by that of the Devonian system, an investigation in

which Sedgwick and Murchison were fellow-laborers, both in the southwest of England and in the Rhinelands. Soon afterward Murchison projected an important geological campaign in Russia with the view of extending to that part of the Continent the classification he had succeeded in elaborating for the older rocks of western Europe. He was accompanied by De Verneuil and Keyserling, in conjunction with whom he produced a magnificent work on *Russia and the Ural Mountains*.

In 1846 he was knighted, and later in the same year he presided over the meeting of the British Association at Southampton. During the later years of his life a large part of his time was devoted to the affairs of the Royal Geographical Society, of which he became president.

In the year 1855 Murchison was appointed director-general of the geological survey and director of the Royal School of Mines and Geological Museum, Jermyn street, London, in succession to Sir Henry de la Beche, who had been the first to hold these offices.

One of the closing public acts of Murchison's life was the founding of a chair of geology and mineralogy in the university of Edinburgh, for which he gave the sum of £6,000, an annual sum of £200 being likewise provided by a vote in parliament for the endowment of the professorship. While the negotiations with the government in regard to this subject were still in progress, Murchison was seized with a paralytic affection on November 21, 1870. At first his life was in danger, but he eventually rallied, and was able to see his friends, read, and take interest in current affairs until the early autumn of the following year, when his malady began to make rapid progress. At last, after a brief attack of bronchitis, he died October 22, 1871.

MURCIA, a maritime province of southeastern Spain, is bounded on the east and south by Alicante and the Mediterranean, on the west by Almeria and Granada, and on the north by Albacete, and has an area of 4,478 square miles; the population of the province in 1897 was 518,263. Besides the cities of Murcia, Cartagena, and Lorca, the following towns in that year had a population exceeding 5,000:—Abanilla, Águilas, Alhama, Bullas, Caravaca, Cehegin, Cieza, Fortuna, Fuente-Álamo, Jumilla, Mazarron, Molina, Moratalla, Mula, Torre-Pacheco, Totana, La Union, Yecla.

MURCIA, a city of Spain, capital of the above province. Murcia has been the seat of the bishop of Cartagena since 1261; the present palace was erected in 1748–52. Near it are the colleges of San Fulgencio and San Isidoro. The population in 1897 was 108,408.

MURDER, MANSLAUGHTER. In the law of England (and with some statutory modifications, of the United States) the unlawful killing of a human being is either murder or manslaughter according as it is or is not accompanied by circumstances constituting the element of malice aforethought. That, according to the old definition of Coke, is the criterion by which murder is distinguished from manslaughter. In like manner Blackstone lays it down as a "general rule" that all homicide is in the eye of the law malicious, and therefore murder, unless it is either *justified* by the command or permission of the law, *excused* on account of accident or self-preservation, or *alleviated* into manslaughter by being the involuntary consequence of some act not strictly lawful, or occasioned by some sudden and sufficiently violent provocation. An exact account of these related offenses can only be obtained by an examination of a vast number of judicial decisions, most of which are to be found in the ordinary text-books. "Manslaughter is unlawful homicide without malice aforethought. Murder is unlawful homicide with malice aforethought. Malice aforethought means any one or

more of the following states of mind preceding or coexisting with the act or omission by which death is caused, and it may exist when that act is unpremeditated: (a) an intention to cause the death of, or grievous bodily harm to, any person, whether such person is the person actually killed or not; (b) knowledge that the act which causes death will probably cause the death of, or grievous bodily harm to, some person, whether such person is the person actually killed or not, although such knowledge is accompanied by indifference whether death or grievous bodily harm is caused or not, or by a wish that it may not be caused; (c) an intent to commit any felony whatever; (d) an intent to oppose by force any officer of justice on his way to, on, or returning from the execution of the duty of arresting, keeping in custody, or imprisoning any person whom he is lawfully entitled to arrest, keep in custody, or imprison, or the duty of keeping the peace or dispersing an unlawful assembly, provided that the offender has notice that the person killed is such an officer so employed." The expression "officer of justice" in this clause includes every person who has a legal right to do any of the acts mentioned, whether he is an officer or a private person. Notice may be given either by word, by the production of a warrant or other legal authority, by the known official character of the person killed, or by the circumstances of the case. Art. 224 of Justice Stephen's *Digest of the Criminal Law*, states that "homicide which would otherwise be murder is not murder but manslaughter if the act by which death is caused is done in the heat of passion, caused by provocation," the acts amounting to which are enumerated. But provocation does not extenuate the offense "unless the person provoked is at the time when he does the act deprived of the power of self-control by the provocation which he has received, and in deciding the question whether this was or was not the case regard must be had to the nature of the act by which the offender caused death, to the time which elapsed between the provocation and the act which caused death, to the offender's conduct during that interval, and to all other circumstances tending to show the state of his mind."

The most notable difference between England and the United States in regard to the law on this subject is the recognition by recent State legislation of degrees in murder. English law treats all unlawful killing not reducible to manslaughter as of the same degree of guilt. American statutes seek to discriminate between the graver and the less serious forms of the crime. Thus an Act of the legislature of Pennsylvania (April 22, 1794) declares all murder which shall be perpetrated by means of poison or by lying in wait or by any other kind of willful, deliberate, and premeditated killing, or which shall be committed in the perpetration of or attempt to perpetrate any arson, rape, robbery, or burglary, shall be deemed murder of the first degree; and all other kinds of murder shall be deemed murder of the second degree. This statute, says Bishop, "is the parent of all the others." In Michigan it has been enacted in exact words; and in most of the other States which have adopted this line of legislation the departure from the language of the Pennsylvania provision is not such as calls for the application of different principles of interpretation. It is pointed out by Bishop that the language used in these statutes to discriminate the degrees of murder is similar to that by which the common law distinction between murder and manslaughter is usually expressed. Thus in Massachusetts murder committed with "deliberately premeditated malice aforethought" is in the first degree. In Indiana the expression used is "purposely and of deliberate and premeditated malice."

MURDOCK, WILLIAM, inventor, was born near the village of Auchinleck, in Ayrshire, on August 25, 1754. He retired from business in 1830, and died in 1839.

MURE, WILLIAM, historian of Greek literature, was born at the family seat near Caldwell, Ayrshire, Scotland, July 9, 1799, and died in 1860.

MURET, or MURETUS, MARC ANTOINE, French humanist, was born at Muret, near Limoges, on April 12, 1526. He died in 1585.

MURGER, HENRY, French man-of-letters, was born in February, 1822, at Paris. His father was a *concerge*, with which employment he combined the trade of tailoring. At the age of fifteen Murger was sent into a lawyer's office, but the occupation was very uncongenial to him, and his father's trade still more so. He thus incurred the paternal displeasure, and in his devotion to literature and liberty began to meet with not a few of the hardships which he afterward described. He was, however, for a time saved from actual want by the employment of secretary to the Russian Count Tolstoy, which was procured for him by M. de Jouy (an old academicien of the classical faction, but a very kind friend to youthful literary aspirants) in the year 1838. For the next ten years little positive is known of Murger's life except that it probably provided the experiences, and certainly supplied him with the ideas, of his most famous book. He made his first independent appearance as an author in 1843 with a book entitled *Via Dolorosa*, but it made no mark. He also tried journalism, and the paper *Le Castor*, which figures in the *Vie de Bohème*, and which combined devotion to the interests of the hat trade with recondite philosophy and elegant literature, is said to have been a fact, though a shortlived one. At length he was introduced to better work, either in the *Corsaire*, then a favorite organ of the second romantic generation, or in the *Artiste*; for both stories are told. In 1848 appeared the collected sketches called the *Vie de Bohème*. This book, which is of its kind famous, describes the fortunes and misfortunes, the loves, studies, amusements, and sufferings, of a group of impecunious students, artists, and men of letters, of whom Rodolphe represents Murger himself, while the others have been more or less positively identified. Murger, in fact, belonged to a set or clique of so-called Bohemians, the most remarkable of whom, besides himself, were Privat d'Anglemont and Champfleury.

From the date above mentioned it was perfectly easy for him to make a comfortable living by journalism and general literature. He was introduced in 1851 to the *Revue des Deux Mondes*, and contributed to it for two or three years, and he never had any difficulty in securing or keeping literary employment. But he was a slow, a fastidious, and a very capricious worker, and his years of hardship and dissipation had very seriously impaired his health. He continued, however, to produce work pretty regularly, publishing *Cluude et Marianne* in 1851, *Le Dernier Rendezvous* and *Le Pays Latin* in 1852; *Adeline Protat* (one of the most graceful and innocent if not the most original of his tales) in 1853, and *Les Buvards d'Eau* in 1854. This last, the most powerful of his books next to the *Vie de Bohème*, exhibits a reverse side to the picture by tracing the fate of certain artists and students who, exaggerating their own powers and foolishly disdaining merely profitable work, come to an evil end not less rapidly if more respectably than by dissipation. Some years before his death, which took place in a *maison de santé* near Paris on January 28, 1861, Murger went to live at Marlotte, near Fontainebleau, and it was there that he wrote, and in 1859 published, an unequal book entitled *Le Sabot Rouge*, in which the character of the French peasant is very uncomplimentarily treated. Besides the books already

mentioned, Murger's published works fill several volumes of prose and one of verse. The poems contained in the latter (*Les Nuits d'Hiver*) are not very strong, but graceful and frequently pathetic.

MURILLO, BARTOLOMÉ ESTEBAN, the greatest ecclesiastical painter of Spain, was the son of Gaspar Esteban Murillo and Maria Perez, and was born at Seville in 1617, probably at the very end of the year, as he was baptized on January 1, 1618. His parents resolved to place him under the care of their distant relative, Juan del Castillo, the painter. Murillo in a few years painted as well as his master, and as stiffly. Struck by the favorable change which travel had wrought upon the style of his brother artist Pedro de Moya, Murillo in 1642 resolved to make a journey to Flanders or Italy in quest of further insight into art. But how was he, already struggling for existence and with a poor sister dependent on him, to raise the means necessary for such an expedition? Having bought a large quantity of canvas, he cut it into squares of different sizes, which he converted into pictures of a kind likely to sell. The American traders at once bought up his pieces, and he now found himself sufficiently rich to carry out his much-cherished design. He placed his sister under the care of some friends, and without divulging his plans to anyone set out for Madrid. On reaching the capital he waited on Velazquez, his fellow-townsmen, the great court-painter, then at the summit of his fortune, and, communicating to him his simple story, asked for some introduction to friends in Rome. The master liked what he saw of the manly youth, and in the noblest manner offered him lodging in his own house, and proposed to procure him admission to the royal galleries of the capital. Murillo accepted the offer, and here enjoyed the masterpieces of Italy and Flanders without traveling beyond the walls of Madrid. The next two years were chiefly spent in copying from Ribera, Vandyck, and Velazquez; and in 1644 he so greatly astonished the latter with some of his efforts that they were submitted to the inspection of the king and the court. His patron now urged him to go to Rome, and offered him letters to smooth his way; but Murillo, from whatever cause, preferred returning to his sister and his native Seville.

The friars of the convent of San Francisco in Seville had about this time piously determined to adorn the walls of their small cloister in a manner worthy of their patron saint. But the brotherhood had no money; and after endless begging they still found themselves incapable of employing an artist of name to execute the task. Murillo was needy, and offered his services; after balancing their own poverty against his obscurity the friars bade him begin. Murillo covered the walls with eleven large pictures of remarkable power and beauty, displaying by turns the strong coloring of Ribera, the lifelike truthfulness of Velazquez, and the sweetness of Vandyck. Among them were to be found representations of San Francisco, of San Diego, of Santa Clara, and of San Gil. These pictures were executed in his earliest style, commonly called his *frio* or cold style. It was chiefly on Ribera and Caravaggio, and was dark with a decided outline. This rich collection is no longer to be met with in Seville; Marshal Soult carried off ten of the works. The fame of these striking productions soon got abroad, and "El Claustro Chico" swarmed daily with artists and critics. Murillo was no longer friendless and unknown. The rich and the noble of Seville overwhelmed him with their commissions and their praises.

In 1648 Murillo married a wealthy lady of rank, Doña Beatriz de Cabrera y Sotomayor, of the neighborhood of Seville and his house soon became the favorite resort

of artists and connoisseurs. About this time he was associated with the landscape-painter Yriarte—the two artists interchanging figures and landscapes for their respective works; but they did not finally agree, and the coöperation came to an end. Murillo now painted the well-known *Flight into Egypt*, and shortly afterward changed his earliest style of painting for his *calido* or warm style. His drawing was still well defined, but his outlines became softer and his figures rounder, and his coloring gained in warmth and transparency. His first picture of this style, according to Cean Bermudez, was a representation of Our Lady of the Conception, and was painted in 1652 for the brotherhood of the True Cross; he received for it 2,500 reals (\$130). In 1655 he executed his two famous paintings of *San Leandro* and *San Isidoro* at the order of Don Juan Federigo, archdeacon of Carmona, which are now to be seen in the cathedral of Seville. These are two noble portraits finished with great care and admirable effect, but the critics complain of the figures being rather short. His next picture, the *Nativity of the Virgin*, painted for the chapter, is regarded as one of the most delightful specimens of his *calido* style. In the following year (1656) the same body gave him an order for a vast picture of San Antonio de Padua, for which he received 10,000 reals (\$520). This is one of his most celebrated performances, and still hangs in the baptistery of the cathedral. The same year saw him engaged on four large pictures of a semicircular form, designed by his fast friend and patron Don Justino Neve y Yevenes, to adorn the walls of the church of Santa Maria la Blanca. The first two were meant to illustrate the history of the festival of Our Lady of the Snow, or the foundation of the Roman basilica of Santa Maria Maggiore. The one represents the wealthy but childless Roman senator and his lady asleep and dreaming, the other exhibits the devout pair relating their dream to Pope Liberius. Of these two noble paintings the *Dream* is the finer, and in it is to be noticed the commencement of Murillo's third and last style, known as the *vaporoso* or vapory. In the *vaporoso* method the well-marked outlines and careful drawing of his former styles disappear, the outlines are lost in the misty blending of the light and shade, and the general finish betrays more haste than was usual with Murillo. After many changes of fortune, these two pictures now hang in the Academy of San Fernando at Madrid.

In 1658 Murillo undertook and consummated a task which had hitherto baffled all the artists of Spain, and even royalty itself. This was the establishing of a public academy of art. By superior tact and good temper he overcame the vanity of Valdes Leal and the presumption of the younger Herrera, and secured their coöperation. The Academy of Seville was accordingly opened for the first time in January, 1660, and Murillo and the second Herrera were chosen presidents. The former continued to direct it during the following year; but the calls of his studio induced him to leave it, now flourishing and prosperous, in other hands.

Passing over some half-length pictures of saints and a dark-haired Madonna, painted in 1668 for the chapter-room of the cathedral of his native city, we enter upon the most splendid period of Murillo's career. In 1661 Don Miguel Mañara Vicentelo de Leca, who had recently turned to a life of sanctity from one of the wildest profligacy, resolved to raise money for the restoration of the dilapidated Hospital de la Caridad, of whose pious guild he was himself a member. Mañara commissioned his friend Murillo to paint eleven pictures for this edifice of San Jorge. Three of these pieces represented the Annunciation of the Blessed Virgin, the Infant Savior, and the Infant St. John. The remaining eight are considered Murillo's masterpieces. They

consist of *Moses Striking the Rock*, *The Return of the Prodigal*, *Abraham Receiving the Three Angels*, *The Charity of San Juan de Dios*, *The Miracle of the Loaves and Fishes*, *Our Lord Healing the Paralytic*, *St. Peter Released from Prison by the Angel*, and *St. Elizabeth of Hungary*. These works occupied the artist four years, and in 1674 he received for his eight great pictures 78,115 reals or about \$4,000. The *Moses*, the *Loaves and Fishes*, and the *San Juan* are still to be found at Seville; but the French carried off the rest. The front of this famous hospital was also indebted to the genius of Murillo; five large designs in blue glazed tiles were executed from his drawings. He had scarcely completed the undertakings for this edifice when his favorite Franciscans again solicited the aid of his pencil. He accordingly executed some twenty paintings for the humble little church known as the Convent de los Capucinos. Seventeen of these Capuchin pictures are still preserved in the Museum of Seville. Of these the *Charity of St. Thomas of Villanueva* is reckoned the best. Another little piece of extraordinary merit, which once hung in the church, is the *Virgin of the Napkin*, believed to have been painted on a "servilleta" and presented to the cook of the Capuchin brotherhood as a memorial of the artist's pencil.

In 1670 Murillo is said to have declined an invitation to court, preferring to labor among the brown coats of Seville. Eight years afterward his friend the canon Justino again employed him to paint three pieces for the Hospital de los Venerables; the *Mystery of the Immaculate Conception*, *St. Peter Weeping* and the *Blessed Virgin*. As a mark of esteem Murillo next painted a full-length portrait of the canon, in which all the artist's skill is visible. The sleek spaniel reposing at the feet of the priest has been known before now to call forth a snarl from a living dog as he approached it. His portraits generally, though few, are of great beauty. Toward the close of his life Murillo executed a series of pictures illustrative of the life of "the glorious doctor" for the Augustinian convent at Seville. This brings us to the last work of the artist. Mounting a scaffolding one day at Cadiz (whither he had gone in 1681), to execute the higher parts of a large picture of the *Espousal of St. Catherine*, on which he was engaged for the Capuchins of that town, he stumbled, and fell so violently that he received a hurt from which he never recovered. The great picture was left unfinished, and the artist returned to his beloved Seville only to die. He died as he had lived, a humble, pious, brave man, on April 3, 1682, in the arms of the chevalier Pedro Nuñez de Vilavicencio, an intimate friend and one of his best pupils.

MUROM, a district town of Russia, in the province of Vladimir, on the craggy left bank of the Oka close by its junction with the Teshá, 107 miles by rail southeast of Vladimir. The population is 11,000.

MURPHY, ARTHUR, dramatist, was the son of a Dublin merchant, and was born near Elphin, in Roscommon, in 1727. He died in June, 1805.

MURPHY, ROBERT, mathematician, was the son of a poor shoemaker, and was born in Mallow, in Ireland, in 1806. He died in 1843.

MURRAIN, a term usually restricted to extensive outbreaks of disease in cattle, but also applied to serious disorders among sheep and pigs, is taken in this article to cover general or infectious disorders of all the domesticated animals, and as synonymous with plague or epizooty. We here mention the best known and most destructive forms of murrain.

1. *Anthrax*.—This is one of the most diffused and interesting of murrains, affecting, as it does, wild as well as domesticated animals. It prevails, in one or more of its forms, over the entire surface of the globe.

Symptoms.—These vary according as the disease runs its course as a general or localized affection. While death is usually rapid or sudden when the malady is general, constituting what is designated splenic apoplexy or anthrax fever, in the local form, marked by the formation of carbuncles before general infection occurs, it is more protracted. In the apoplectic form there is apparently no local manifestation, and dissolution may take place so quickly (in a few minutes) that there is no time to afford relief. One or more of the best-conditioned and perhaps robust animals in a herd or flock, which until then exhibited no sign of the disease, are suddenly struck down as if shot, while grazing, feeding in the stable, or traveling, and rise no more. Or they commence all at once to tremble or stagger; the breathing becomes hurried and the pulse very rapid, while the heart beats violently; the internal temperature of the body is high; blood flows from the nose, mouth, and anus; the visible mucous membranes are almost black in tint; and death soon supervenes, being immediately preceded by delirium, convulsions, or coma. In some cases the animal rallies from a first attack, but soon a second ensues, to which it speedily succumbs, the creature in the interval remaining drowsy and showing muscular tremors. In the carbuncular form the tumors may appear in any part of the body, being preceded or accompanied by fever. When the tongue is affected, the disease is usually known as blain of the tongue, tongue evil, or glossanthrax.

Anthrax in all its forms is an inoculable disease, transmission being surely and promptly effected by this means, and it may be conveyed to nearly all animals either by inoculation or through the digestive organs. The abraded skin is often the channel for the introduction of the bacilli; and persons who handle diseased animals or their products—as flesh, skin, wool, or hair—often die from anthrax, which presents similar symptoms in mankind to those it exhibits in animals. The bacillus of anthrax, under certain conditions, retains its vitality for a long time, and rapidly grows when it finds a suitable fluid in which to develop, its mode of multiplication being by scission and the formation of spores, and depending, to a great extent at least, on the presence of oxygen. The morbid action of the bacillus is indeed said to be due to its affinity for oxygen; by depriving the red corpuscles of the blood of that most essential gas, it renders the vital fluid unfit to sustain life. Others assert that the fatal lesions are produced by the enormous number of bacilli blocking up the minute blood-vessels, especially of the lungs, and thus inducing asphyxia.

It was by the cultivation of this micro-organism, or attenuation of the virus, that Pasteur has been enabled to produce a prophylactic remedy for anthrax, which has already been demonstrated to be very effective; and his discovery is likely to lead to most important results in procuring protective agents for other similar and fatal disorders in man and beast. Though his discovery was first made with regard to the cholera of fowls, a most destructive disorder which annually carries off great numbers of poultry, yet as applied to anthrax it has attracted most attention. This so-called attenuation or cultivation of the virus of the disease by Pasteur is effected by growing the bacillus in an albuminous fluid, the preference being given to chicken-broth, which has been previously sterilized by being raised to a temperature of 115° C. This broth is inoculated with a drop of anthrax blood which has been taken with antiseptic precautions from an animal about to die of the disease; it is kept in pure air at a temperature of 42° to 43° C.; at 45° the process of cultivation will not go on. After a certain time another quantity of broth is inoculated

with a drop of the first, and kept under the same conditions; and so this cultivation is carried on until a sufficient number of the generations of the bacilli have been grown and the required degree of attenuation insured. This is attained by attention to the temperature, allowing a certain interval to elapse between each inoculation of the broth and the number of generations cultivated. The resulting "vaccine," as it has been improperly designated, when inoculated into the body of an animal liable to anthrax, confers immunity from the disease, if certain rules are attended to.

Toussaint had, previous to Pasteur, attenuated the virus of anthrax by the action of heat; and Chauveau has more recently corroborated by numerous experiments the value of Toussaint's method, demonstrating that, according to the degree of heat to which the virus is subjected, so is its innocuousness when transferred to a healthy creature. The attenuation of heat, according to this method, is a safer and readier way to obtain a protective virus than Pasteur's broth cultivations.

2. *Cattle Plague or Rinderpest.*—The next disease is that which has, since the commencement of the last century, been generally described as "the murrain," but which is now better known as the "cattle-plague" or "rinderpest" (German).

Symptoms.—Among cattle indigenous to the regions in which this malady may be said to be enzootic the symptoms are often comparatively slight, and the mortality not great. In these the indications of fever are usually of brief duration, and signs of lassitude and debility are, in some instances, the only marks of the presence of this virulent disorder in animals which may, nevertheless, communicate the disease in its most deadly form to the cattle of other countries. Slight diarrhea may also be present, and a cutaneous eruption accompanied by gastric disturbance, shedding of tears, and infrequent cough. In the more malignant form the fever runs very high, sometimes to 107.6° Fahr., and all the characteristic symptoms of the disorder are well marked, the lesions during life being observed in the cheese-like deposits on the gums, the presence of petechiæ on the mucous membranes, discharges from the eyes, nose, and mouth, eruption on the skin, cough and labored breathing, certain nervous phenomena, and dysenteric dejections. Death generally occurs in four or five days, the course of the disorder being more rapid with animals kept in stables than with those living in the open air, and in summer than in winter. After death the chief alterations are found in the digestive canal, and consist in evidence of inflammation of a more or less acute kind, with ulceration, extravasation of blood, gangrene, etc. The membrane lining the air-passages offers similar alterations; indeed, all the mucous membranes of the body appear to be involved, and the malady might almost be considered as a malignant infectious catarrhal fever.

Protective inoculation has often been advocated and practiced (particularly in Russia) for this disorder, but the advantages derived have not been sufficient to compensate for the danger attending it. Semmer, of the Dorpat veterinary school, made experiments with cultivated or attenuated virus, and the results have been encouraging.

3. *Pleuro-Pneumonia or Lung Plague.*—The next murrain in importance, with regard to destructiveness, is the so-called "lung-plague" or contagious "pleuro-pneumonia" of cattle.

This disease is particularly interesting from the fact that within less than two centuries it has been spread from a very small area over nearly every part of the world. In its nature it is a specific infectious disease, generally affecting the lungs and the lining membrane of the chest, producing a particular form of lobar or lobu-

lar pieuro-pneumonia, and in the majority of cases, if not in all, it is transmitted through the medium of the inspired air—hence its localization in the lungs. Inoculation with the fluid from the diseased lungs does not produce any effect on other than the bovine species; but in this its action is most energetic. Producing after a certain interval, characteristic lesions at the seat of inoculation, the morbid change or infective process soon involves parts beyond, and if not checked may cause most serious damage and even the death of the inoculated animal; though it does not develop the lung lesions always observed in accidental infection, yet there is a local anatomical similarity or identity.

Symptoms.—The malady is slow and insidious in its course, lasting from two to three weeks to as many months, the chief symptoms being fever, diminished appetite, a short cough of a peculiar and pathognomonic character, with quickened breathing and pulse, and physical indications of lung and chest disease. The progress of the malady is marked by exacerbation of the symptoms, and toward the end there is great debility and emaciation, death generally ensuing after hectic fever has set in. Recovery is somewhat rare.

The pathological changes are generally limited to the chest and its contents, and consist in a peculiar marbled-like appearance of the lungs on section, and fibrinous deposits on the pleural membrane, with oftentimes great effusion into the cavity of the thorax. Willems of Hasselt (Belgium) in 1852 introduced and practiced inoculation as a protective measure for this scourge, employing for this purpose the serum obtained from a diseased lung; and his success was so marked that he made known his procedure. Since that time inoculation has been extensively resorted to, not only in Europe, but also in America, Australia and South Africa; and its protective value has been generally recognized. When properly performed, and when certain precautions are adopted, it would appear to confer immunity from the disease. The usual seat of inoculation is the extremity of the tail, the virus being introduced beneath the skin by means of a syringe or a worsted thread impregnated with the serum. One or two drops are sufficient to cause the local and constitutional disturbance which mark successful prophylactic infection. A particular micro-organism has been discovered in the diseased textures and fluids of animals affected with contagious pleuro-pneumonia, which is supposed to cause the malady. It has been cultivated, and inoculation experiments have been made with it. The intravenous injection of the virus has been found to be a safer method of conferring immunity than inoculation beneath the skin, and quite as certain a method.

4. **Foot-and-Mouth-Disease** (Epizootic Aphtha, Eczema epizootica). During this century, owing to the vastly extended commercial relations between every civilized country, it has, like the lung-plague, become widely diffused. In the Old World its effects are now experienced from the Caspian Sea to the Atlantic Ocean. It gradually extended toward Britain at the commencement of this century, after invading Holland and Belgium, and about 1839 appeared in England, where it was immediately recognized as a new disease; it quickly spread over the three kingdoms. From the observations of the best authorities it would appear to be an altogether exotic malady in the west of Europe, always invading it from the east; at least, this has been the course noted in all the principal invasions. It was introduced into Denmark in 1841, and into the United States of America from Canada, where it had been carried by diseased cattle from England. It rapidly extended through cattle traffic from the State first invaded to adjoining States, but was extinguished and does not now appear to be prev-

alent on the American continent. It was twice introduced into Australia in 1872, but was stamped out on each occasion. Though not a fatal malady, and in the majority of cases readily amenable to treatment, yet it is a most serious scourge. It is transmissible to nearly all the domestic animals, even mankind sometimes becoming infected, but its ravages are most severe among cattle, sheep and pigs.

These are the best-known murrains affecting cattle; but there are others which, though they cannot be noticed here, are of some moment. One in particular demands most serious consideration, the disease known as "consumption," "pining," and (from the appearance of the morbid growths in the chest) "grapes," and to the medical and veterinary pathologist as "tuberculosis." It is a highly-infectious disorder in cattle, is becoming very common among the improved breeds, and causes heavy losses in dairy stock. It has been experimentally demonstrated that the tuberculous matter, as well as milk and the juice of the flesh of diseased cows, when given to healthy animals or inoculated in them, will produce the malady, and this leads to the grave question as to the danger incurred by mankind through the consumption of the flesh and milk of tuberculous cows. This is a pressing sanitary problem which demands early solution.

The legislative measures necessary for prevention or suppression of murrains are based upon the fact that these diseases depend for their extension solely upon their contagious properties. The object is, therefore, either to prevent the admission of the contagious principle, *i.e.*, through diseased animals or articles which have become infective by contact with them, or to destroy it as quickly as possible. The necessity for this is abundantly evident on every page in the history of scourges, and the governments of most civilized countries have taken the matter in hand and enacted regulations designed to prevent the importation of diseased cattle into their territory.

MURRAY COD. Of the numerous freshwater perches inhabiting the rivers and watercourses of Australia the Murray Cod (*Oligorus macquariensis*) is one of the largest, if not the largest, and the most celebrated on account of the excellent flavor of its flesh. In conferring upon the fishes of the new country familiar names, the early colonists were evidently guided by the fancied resemblance in taste or appearance to some fish of their northern home rather than by a consideration of their taxonomic affinities. These, as far as the Murray Cod is concerned, lie in the direction of the perch and not of the cod family. As implied by the name, this fish has its headquarters in the Murray river and its tributaries, but it occurs also in the northern part of New South Wales. It is the most important food fish of these rivers, and is said to attain to a length of more than three feet, and to a weight of 120 pounds.

MURRAY RIVER, the largest river in Australia, rises in the Australian Alps, and, flowing north-westward, skirts the borders of New South Wales and Victoria until it passes into South Australia, shortly after which it bends southward into Lake Alexandrina, a shallow lagoon, whence it makes its way to the sea at Encounter Bay by a narrow opening. Near its source, the Murray Gates, precipitous rocks, tower sheer above it to the height of 3,000 feet; and the earlier part of its course is very tortuous, broken and uneven. Farther on it in some parts loses so much by evaporation as to become merely a series of pools. Its length till it debouches into Lake Alexandrina is 1,120 miles, its average breadth in summer is 240 feet, its average depth about sixteen; and it drains an area of about 270,000 square miles. For small steamers it is navigable as far as Al-

bury. Periodically it overflows its banks, causing wide inundations.

MURRAY, or MORAY, JAMES STUART, SECOND EARL OF, regent of Scotland, was the illegitimate son of James V. by Margaret Erskine, daughter of the fourth Lord Erskine. Under the tutorship of George Buchanan his intellectual training was carefully attended to, and as early as his fifteenth year he gave evidence of rare courage and decision by an impetuous attack on an English force which had made a descent on the Fife coast, and which he routed with great slaughter. In addition to the priory of St. Andrews, he subsequently received those also of Pittenweem and of Mascon (France), but on reaching manhood he manifested no vocation for monasticism. The discourses of Knox, which he heard at Calder, won his high approval, and shortly after the return of the Reformer in 1559 Murray left the party of the queen-regent and joined the lords of the congregation, who resolved to adopt the bold measure of forcibly abolishing the Popish service. After the return of Queen Mary in 1561 he became her chief adviser, and his cautious firmness was for a time effectual in inducing her to adopt a policy of moderation and tolerance toward the Reformers. In 1562 he was created earl of Mar, and soon after married Lady Agnes Keith, daughter of the earl marischal. The earldom of Mar being claimed by Lord Erskine, he resigned the title and property and was created earl of Murray. After the defeat of Lord Huntly, leader of the Catholic party, who died soon afterward, the policy of Murray met for a time with no obstacle or hindrance, but he awakened the displeasure of the queen by his efforts in behalf of Knox when accused of high treason, and, as he was also strongly opposed to her marriage with Darnley, he was after that event declared an outlaw and compelled to take refuge in England. Returning after the death of Rizzio, he found the sentiments of the queen toward him very greatly altered, and received a full pardon. On the abdication of Queen Mary at Lochleven he was appointed regent. The position was full of temptation and difficulty, but his conspicuous integrity and moderation, joined to unflinching courage and the utmost readiness of resource, proved to be adequate to what the circumstances demanded. When Mary made her escape from Lochleven, he occupied her attention with pretended negotiations until he had gathered his adherents in sufficient force, when he completely defeated her at Langside (May 13, 1568) and compelled her to flee to England. Immediately afterward he frustrated an attempt at insurrection by the duke of Chatelherault, whom he confined in the castle of Edinburgh. The disappointed partisans of the queen resolved to have revenge, and one of their number, Hamilton of Bothwellhaugh, shot him through the body at Linlithgow, January 21, 1570. The wound proved fatal, and he died the same evening.

MURRAY, JOHN, M.D., lecturer on chemistry and materia medica, was born in Edinburgh in 1778 and died in 1820.

MURRAY, SIR ROBERT, one of the founders of the Royal Society, was the son of Sir Robert Murray, of Craigie, Ayrshire, Scotland, and was born about the beginning of the seventeenth century. In early life he served for some years in the French army, and rose to the rank of colonel. On the outbreak of the civil war he returned to Scotland, and was energetic in collecting recruits for the royal cause. The triumph of Cromwell compelled him for a time to return to France, but he took an active part in the Scottish insurrection in favor of Charles II. in 1650, and was named lord justice clerk and a privy counselor. Soon after this event Sir Robert Murray began to take a prominent part in the

deliberations of a club instituted in London for the discussion of natural science, or, as it was then called, the "new philosophy." When it was proposed to obtain a charter for the society, he undertook to interest the king in the matter, the result being that on July 15, 1662, the club was incorporated by charter under the designation of the Royal Society. Sir Robert Murray was its first president, and during the remainder of his life exerted himself with great zeal and ability to extend its influence. He died in June, 1673.

MURREE, or MARRI, a sanitarium and hill station in the Rāwal Pindi district, Punjab.

MURSHIDĀBĀD, or MOORSHEDEBĀD, a district in the lieutenant-governorship of Bengal. The area is 2,141 square miles. The district is divided into two nearly equal portions by the Bhāgirathi, the ancient channel of the Ganges, which flows due north and south. The tract to the west, known as the Rār, consists of hard clay and nodular limestone. The general level is high, but interspersed with *bils* or broad marshes, and seamed by hill torrents. The Bāgri or eastern half differs in no respect from the ordinary alluvial plains of eastern Bengal.

The census of 1901 returned the population of the district at 1,526,790. The six following towns contained in 1888 a population exceeding 5,000: Murshidābād, 46,182; Barhampur, 27,210; Kandi, 12,016; Jangipur, 11,361; Beldanga, 6,037; and Margrām, 5,766.

MURSHIDABAD, principal city of the above district, is situated on the left bank of the Bhāgirathi river. Its importance has entirely departed since it ceased to be the capital of Bengal, and its population has steadily diminished. In 1901 the population was 46,182 (Hindus 27,211, Mohammedans 18,824, Christians 38, "others" 109). It is still a great center of trade and manufacture, and the Jain merchants of Murshidābād rank as the wealthiest of their class in Bengal.

MURZUK. See FEZZAN.

MUS, the name of a family of the plebeian gens of the Decii. Two members of the family, a father and a son, crowned distinguished careers in the service of Rome by a singular act of self-devotion.

MUSÆUS is the name of three Greek poets. The first is an almost fabulous personage, who is said to have flourished in Attica, and to have been buried on the Museum Hill in Athens. The second Musæus was an Ephesian who was attached to the court of the Pergamene kings. The third is of uncertain date, but probably belongs to the fifth century A.D., as the structure of his hexameters is evidently modeled after the canons of Nonnus. The poem in 340 lines which he wrote on the story of Hero and Leander is by far the most beautiful Greek poem of the age.

MUSÄUS, J. K. A., a German author. He studied theology at Jena, his birthplace, and would have become the pastor of a parish but for the resistance of some peasants, who objected that he had been known to dance. In 1760 to 1762 he published in three volumes his first work, *Grandison der Zweite*, afterward (in 1871-72) rewritten and issued with a new title, *Der deutsche Grandison*. The object of this book was to show the comic aspects of Richardson's hero, who had many sentimental admirers in Germany. In 1763 Musäus was made tutor of the court pages at Weimar, and in 1770 he became a professor at the Weimar gymnasium. His second book—*Physiognomische Reisen*—did not appear until 1778-79. It was directed against Lavater, and attracted much favorable attention. In 1782-86 he published his most famous work, *Volksmärchen der Deutschen*. Born 1735, died 1787.

MUSCAT, or more correctly MASKAT, the chief

town of 'Omán in Arabia, lies upon the seacoast, at the extremity of a small cove in the gorges of a great pass leading inland through dark mountain walls, scorched with the sun and utterly without vegetation, which rise almost right out of the sea to a height of from 300 to 500 feet on both sides of the cove.

Around the cape which forms the northwest limit of the cove lies the prosperous and well-built town of Matrah, with 20,000 to 25,000 inhabitants, and a considerable production of 'Omán stuffs. It may be regarded as a suburb of Muscat, though the land road over the cape is so rough that communication between the towns is conducted chiefly by boats.

MUSCATINE, the capital of Muscatine county, Iowa, has a population of 14,073, and is an important shipping and manufacturing point. It is finely situated on the Mississippi river, at the junction of several railroads, and contains packing-houses, plow and furniture factories, national banks, newspaper offices, and many churches and schools.

MUSCINEÆ. The Muscineæ are a highly interesting class of plants on account of the important part they play in the economy of nature, and also from the remarkable conditions of their development and formation. In many parts of the world it is principally the mossy covering of forests which, by collecting the rainfall like a sponge, prevents the pouring down from mountains of violent and excessive torrents of water, while the Bog-moss (*Sphagnum*) plays an important part in the formation of peat; and many other Mosses which grow on rocks produce by the decay of their dead parts a thin layer of mold (humus) in which the seeds of higher plants are able to take root. The importance, however, of Mosses in a morphological point of view proceeds from their position in the botanical system. The Muscineæ immediately follow the first division of the vegetable kingdom, the Thallophytes, under which are included the Algæ and Fungi, because their vegetative body is a "thallus"—that is to say, is not divided into stem and leaf like that of higher plants, nor are they possessed of roots like those observed in higher plants, (Ferns, Conifers, Monocotyledons, Dicotyledons, etc.) Their anatomical structure is also very simple, the individual essential tissue-elements being but little differentiated from each other.

MUSES, THE, according to the view which prevailed among the Greek writers and has become a commonplace of modern literature, were nine goddesses who presided over the nine principal departments of letters; Calliope, Muse of epic poetry; Euterpe, of lyric poetry; Erato, of erotic poetry; Melpomene, of tragedy; Thalia, of comedy; Polyhymnia, of the hymn as used in the worship of the gods; Terpsichore, of choral song and the dance which formed its necessary accompaniment; Clio, of history; and Urania, of astronomy. They are represented in ancient art as fully draped figures characterized by attitude, dress, and symbols appropriate to the departments over which they presided. In the simpler conception that prevails in earlier literature they were said to be daughters of Zeus and Mnemosyne, i.e., memory personified. In chorus around the altar of Zeus they sing the origin of the world, of gods, and of men, the might and the glorious deeds of Zeus. At the banquets of the gods their joyous music is heard. They honor also the great heroes; they sing at the marriage of Cadmus and of Peleus; their mourning song at the death of Achilles drew tears from both gods and men. They know all things past and future and impart to their chosen poets the knowledge and the skill to write. They are usually maiden goddesses, but some of the mythic poets—Orpheus, Linus, Ialemus—are said to be sons of a Muse.

This conception of the number and character of the Muses is as old as Hesiod and the *Odyssey* (xxiv. 60), yet it is far removed from the genuine religious stratum out of which the poets fashioned it. The religion of the Muses had two chief seats, on the northern slope of Mount Olympus around Dion in Pieria, by the holy springs Leibethron and Pimpleia, and on the slope of Mount Helicon near Ascræ and Thespiae. Nothing is known of the cultus in its older form, but it appears to have been connected with the religion of Dionysus. The Muses must have been originally a variety of the Nymphs (see NYMPHS), the spirits of nature who live in the fountains and forests; hence they are associated with Pegasus, the winged horse-of the thunder-cloud.

MUSHROOM. There are few more useful, more easily recognized, or more delicious members of the vegetable kingdom than the common mushroom, (*Agaricus campestris*, L.) It grows in short grass in the temperate regions of all parts of the world. Many edible Fungi depend upon minute and often obscure botanical characteristics for their determination, and may readily be confounded with worthless or poisonous species, but that is not the case with the Common Mushroom, for, although several other species of *Agaricus* somewhat closely approach it in form and color, yet the true mushroom, if sound and freshly gathered, may be distinguished from all other Fungi with great ease. It almost invariably grows in rich, open, breezy pastures, in places where the grass is kept short by the grazing of horses, herds, and flocks. Although this plant is popularly termed the "meadow mushroom," it never as a rule grows in meadows. It never grows in wet, boggy places, never in woods or on or about stumps of trees. An exceptional specimen or an uncommon variety may sometimes be seen in the above-mentioned abnormal places, but the best, the true, and common variety of our tables is the produce of short, upland, wind-swept pastures. A true mushroom is never large in size; its cap very seldom exceeds four, at most five, inches in diameter. The large examples measuring from six to nine or more inches across the cap belong to *Agaricus arvensis* (Sch.), called from its large size and coarse texture the Horse Mushroom, which grows in meadows and damp shady places, and though generally wholesome is coarse and sometimes indigestible. The mushroom usually grown in gardens or hotbeds, in cellars, sheds, etc., is a distinct variety, known as *Agaricus hortensis*, (Cke.) This is a compact and inferior form of the true mushroom, or it may indeed be a hybrid or even a distinct species.

The parts of a mushroom consist chiefly of stem and cap; the stem is furnished with a clothy ring around its middle, and the cap is furnished underneath with numerous radiating colored gills. When a mushroom is perfectly ripe and the gills are brown-black in color, they throw down a thick dusty deposit of fine brown-black or purple-black spores; it is essential to note the color. The spores on germination make a white felted mat, more or less dense, of mycelium; this, when compacted with dry, half-decomposed dung, is the mushroom spawn of gardeners. The stem is firm, slightly pithy up the middle, but never hollow; it is furnished with a floccose ring near its middle; this ring originates by the rupture of the thin general wrapper of the infant plant. On being cut or broken the flesh of a true mushroom remains white or nearly so, the flesh of the coarser Horse Mushroom changes to buff or sometimes to dark brown. To summarize the characteristics of a true mushroom—it grows only in pastures; it is of small size, dry, and with unchangeable flesh; the cap has a frill; the gills are free from the stem, the spores brown-black or deep purple-black in color, and the stem solid or slightly pithy.

When all these characters are taken together no other mushroom-like fungus can be confounded with it.

MUSIC is the art which employs sounds as a medium of artistic expression for what is not in the province of literature, of sculpture, of painting, of acting, or of architecture. The indefiniteness of musical expression furnishes no argument that music is inexpressive, but is one of the qualities that place it on the highest level of art-excellence, enabling it to suggest still more than it displays, and to stimulate the imagination of the witness as much as to exercise that of the artist. The musician is then a poet, whether we regard the term in its primary sense of "maker," the exact translation of the Greek word by which versifiers were styled in early English, or in its applied sense of one who expresses thought and feeling through the medium of highly-excited imagination. Music, then, is that one of the fine arts which appropriates the phenomena of sound to the purposes of poetry, and has a province of its own in many respects analogous to, but yet wholly distinct from, that of each of the other arts. It is common to style it "the universal language;" but the definition is untrue, for in every age and in every clime there are varieties of musical idiom which are unsympathetic, if not unintelligible, to other generations than those among whom they are first current, and, still more, the very principles that govern it have been and are so variously developed in different times and places that music which is delightful at one period or to one people is repugnant at another epoch or to a different community.

To define the special science, and the art which is its application, that is denoted by our word *music*, the Greek language has two other words, *harmonia* or *harmonike* and *melodia*—*harmonia* implying the idea of "fitting," and so being a term for propriety or general unity of parts in a whole, not in our limited technical sense of *combined sounds*, but with reference to the whole principle of orderly and not specially tonal regulation, *melodia* implying the rising and falling of the voice in speech, and being applied only at a subsequent epoch to a *succession of musical notes*.

We thus owe our three chief musical terms to the Greeks, and in our prevailing system much more besides; they themselves, however, owed all to earlier sources, for the essentials of their knowledge and practice are traced to Egypt.

Instruments of percussion are supposed to be the oldest, wind instruments the next in order of time and of civilization, and string instruments the latest invention of every separate race. The clapping of hands and stamping of feet, let us say, in marking rhythm exemplify the first element of music, and the large family of drums and cymbals and bells is a development of the same principle. Untutored ears are quicker to perceive rhythmical accentuation than variations of pitch, so the organ of time makes earlier manifestation than the organ of tune, though, musical sound being a periodic succession of vibrations, the operation of the latter is truly but a refinement on that of the former. The sighing of wind, eminently when passing over a bed of reeds, is Nature's suggestion of instruments of breath; hence have been reached the four methods of producing sound through pipes—by blowing at the end, as in the case of the English flute and the flageolet; at the side, as in that of the ordinary concert flute; through a double reed, as in that of the hautboy or oboe and bassoon; and over a single reed, as in that of the clarinet—all of which date from oldest existing records; and also upon the collection of multitudinous pipes in that colossal wind instrument, the organ. An Egyptian fable ascribes the invention of the lyre to the god Thoth; a different Greek fable gives the same credit

to the god Hermes; and both refer it, though under different circumstances, to the straining of the sinews of the tortoise across its shell—whence it can only be inferred that the origin of the highest advanced class of musical instruments is unknown. This class includes the lyre and the harp, which give but one note from each stretched string; the lute, which, having a neck or finger-board, admits of the production of several notes from each string by stopping it at different lengths with the fingers; the viol, the addition of the bow to which gives capability of sustaining the tone; and the dulcimer, finally matured into the pianoforte, wherein the extremes of instrumental fabrication meet, since this is at once a string instrument and an instrument of percussion, having the hammer of the drum to strike the string of the lyre.

The classic Greeks used music in rhapsodizing or chanting with vocal inflections the epic poems; they employed it in religious rites and to accompany military evolutions; and prizes were awarded for its performance by voices and on instruments (including, during the last two centuries B.C., the organ) at their Olympic and other games. It belonged essentially to the drama, which had its origin in the dithyrambic hymns; these were gradually developed into the tragedy, which took its name from the tragos (goat) that was sacrificed to Dionysus during the performance. Possibly Thespis (536 B.C.) may have spoken the recitations with which he was the first to intersperse the hymns; but some interpreters of Greek writings affirm, and others while doubting do not disprove, that in the mature drama all the characters sang or chanted, seemingly after the manner of the rhapsodists, and the impersonal chorus sang to instrumental accompaniment during their orchestric evolutions, from which motions or marchings the part of the theater wherein the chorus were stationed between the audience and the proscenium was called the orchestra. Here, then, was the prototype of the modern opera, the main departure from which is the transplanting of the chorus to the stage and giving to its members participation in the action. Æschylus wrote the music to his own tragedies; Sophocles accompanied on the cithara the performance of his *Thamyris*, if not of other of his plays; Euripides left the composition of the music for his works to another genius than his own, and such was the case with after dramatists.

In ancient Rome the choristers in tragedies were very numerous, including female as well as male singers; they were accompanied by a large number of instruments, among which trumpets were conspicuous. How or when the musical system of the Greeks fell into disuse is still untraced; certainly it prevailed and engaged the attention of philosophers for some centuries of the Christian era.

The system of notation by letters of the Greek alphabet had fallen into disuse. A system by neumes or pneumata, of later date than St. Gregory, employed signs over or under the syllables to indicate the rising or falling of the voice but not to define its extent, and, in the manner of modern punctuation, to show where breath should be taken. This was followed by, though for a time practiced coincidentally with, one in which the Roman letters stood for notes. Afterward, something like our staff was employed, of which the spaces only and not the lines were used, the syllables being placed in the higher or lower of them to denote to what extent the melody should rise or fall. Of earlier date than anything that has been found of like advance in other countries is a service-book which belonged to Winchester cathedral, and contains music written on the lines as well as in the spaces of a staff of four lines; and this comprises a prayer for Ethelred II., who died in 1016.

One of the most inscrutable things to the modern student is the lateness at which notation was devised for defining the relative length of musical sounds. The rhythmical sense is the earliest of the musical faculties to be developed, and is often the strongest in its development among individuals and nations. Still, the ancients have left no record that they had signs of indication for the length of notes, and centuries rolled over Christendom before there was any chronicled attempt to find a principle for supplying this musical necessity. Here again conjecture will insist that the practice of singing longer and shorter notes with stronger and weaker accent must have prevailed before a system was framed for its regulation; and in this supposition offers that the instincts of the people must have given example for the canons of the schoolmen. Franco of Cologne, in the twelfth century, is the first writer who codified the uses of "measured music," and all he enunciates is expanded in the treatises of Walter Odington, a monk of Evesham, who was appointed archbishop of Canterbury in 1228. At this period and afterward, bar-lines were drawn across the whole or a portion of the staff to show the end of a musical phrase in accordance with that of the line or verse which was to be sung to it, and the number of notes between these bar-lines was more or less, according to the number of syllables in the verse. It was not, however, till more than three hundred years later that music was first divided into bars of equal length, and not until a still later date that these were applied to their most valuable purpose of showing the points of strongest emphasis.

The advance of music was earlier and greater in England than elsewhere. In the fifteenth century Flanders produced the musicians of most esteem and greatest influence. Early among these was Ockenheim or Ockeghem of Hainault (c. 1420-1513), who was surpassed in fame by his pupil Josse Després (more commonly known by what must have been his pet name of Josquin) of Hainault. He practiced the art in his own country, in Italy, in France, and in Austria, and was everywhere regarded as its highest ornament. In the fifteenth century and later, because musical erudition was still applied entirely to the service of the church, and because Italy was the ecclesiastical center, musicians of all lands went to Italy, and especially to Rome. It was, however, in England first, and it has been only in England until America adopted the practice, that academical honors have been given to musicians. John Hamboys (c. 1470), author of some treatises on the art, is the reputed first doctor of music. The knightly calling, in the age of chivalry, not only referred to heroic acts and deeds of arms, but regarded skill in verse and melody, in singing and accompaniment. Princes and nobles of highest rank practiced these arts, and were then styled troubadours, who were sometimes attended and assisted by jongleurs to play to their singing. (See TROUBADOURS.) A similar race of knightly songsters in Germany were the minnesänger. They set great value on the invention of new meters, and he who produced one with a melody to suit it was called a *meister* (master), while he who cast his verses in a previously accepted meter or adapted them to a known melody was styled *tondieb* (tone thief). One of the most meritorious and by far the most prolific of the whole craft—his compositions being numbered by thousands—was Hans Sachs, of Nuremberg (1494-1576). He was by trade a shoemaker, and all the members of the guild followed some such calling, and devoted themselves to the study and practice of song as recreation from their daily labor.

The dawn of the sixteenth century is marked by the

appropriation of musical scholarship to secular writing. It was about that time that the *madrigal* came into vogue. The etymology of the word is obscure, but the class of music to which it is applied is clearly distinguished.

The renowned Roman school, to which we must now pass, owed its existence to the precept as much as to the example of foreigners, chiefly from Flanders. Claude Goudimel (c. 1510-1572), known as Fleming, though his birth is assigned to Avignon, was the first to open a seminary for musical tuition in Rome, and the most famous musicians of the century were its pupils—Palestrina (ob. 1594), Orlando di Lasso (ob. 1594), the brothers Animuccia, the brothers Nanini, and many more.

Though the church from time to time appropriated the secular art-forms from their rise to their maturity, its chief authorities were always jealous of these advances, and issued edicts against them. So in 1322 Pope John XXII. denounced the encroachments of counterpoint, alleging that the voluptuous harmony of the 3ds and 6ths was fit but for profane uses.

It was in the middle of the sixteenth century that the class of composition now ranked as the highest was originated. The *oratorio* dates its existence and its name from the meetings held by San Filippo Neri in the oratory of his church in Rome, at first in 1556, for religious exercise and pious edification. Originally this consisted of *laudi* or short hymns, the extent of which was afterward enlarged; by and by the spoken matter was replaced by singing, and ultimately the class of work took the form in which it is cast by present composers. Such is the source of the didactic oratorio; the dramatic oratorio is an offshoot of the same, but is distinguished by its representation of personal characters and their involvement in a course of action.

Yet another prominent feature in musical history dates from the beginning of the sixteenth century, the practice of hymnody. (See HYMNS.) Luther is said to have been the first to write metrical verses on sacred subjects in the language of the people, and his verses were adapted sometimes to ancient church melodies, sometimes to tunes of secular songs, and sometimes had music composed for them by himself and others. In conjunction with his friend Walther, Luther issued a collection of poems for choral singing in 1524, which was followed by many others in North Germany. The English practice of hymn-singing was much strengthened on the return of the exiled Reformers from Frankfurt and Geneva, when it became so general that, according to Bishop Jewell, thousands of the populace who assembled at Paul's Cross to hear the preaching would join in the singing of psalms before and after the sermon.

The placing of the choral song of the church within the lips of the people had great religious and moral influence; it has had also its great effect upon art, shown in the production of the North German musicians ever since the first days of the Reformation, which abound in exercises of scholarship and imagination wrought upon the tunes of established acceptance.

Opera was first introduced in France by Cardinal Mazarin, who imported a company of Italian performers for an occasion. The first French opera, *Akebar, Roi de Mogul* (1646), was composed by the abbé Mailly for court performance. So was *La Pastorale* (1659), by Cambert, who built his work on the Florentine model, and, encouraged by success, wrote several others, on the strength of which he, with his librettist Perrin, instituted the Académie Royale de Musique, and obtained a patent for the same in 1669, exclusively permitting the public performance of opera.

The ballet has been a favorite subject of court diversion since Beaujoyeaulx produced, in 1581, *Le Ballet Comique de la Roynie*, a medley of dancing, choral singing, and musical dialogue.

In Germany the seed of opera fell upon stony ground. Heinrich Schütz wrote music to a translation of Peri's *Dafne*, which was performed for a court wedding at Torgau in 1627; but only importations of Italian works with Italian singers came before the public until nearly the end of the century.

In England the lyrical drama found an early home. The masques performed at Whitehall and at the Inns of Court were of the nature of opera, and were largely infused with recitative. Eminent among others in their composition were Nicholas Lanier (c. 1588-1664), born of an Italian father who settled in England in 1571; Giovanni Coperario, who during his sojourn in Rome had thus translated his patronymic of John Cooper; Robert Johnson, who wrote the original music for *The Tempest*; Doctor Campion, Ives, and William and Henry Lawes. The name of Henry Purcell (1658-1695) figures brightly in this class of composition; but, except his *Dido and Eneas*, written when he was eighteen, his so-called operas are more properly spoken dramas interspersed with music—music of highly dramatic character, but episodic rather than elemental in the design.

The music of the English Church might demand a separate history, because of its importance by the side of the art of other lands, because of the longer permanence of its examples than of works in other branches, and because of its unbroken succession of contributors, covering a period of beyond three centuries, whose style has varied with the age in which they wrought, but who in this department have ever aimed to express themselves at their highest. Here, however, only the names of the most noted writers, with an approximation to chronological order, can be given—Tallis, Byrde, Farrant, Orlando Gibbons, Doctor Child, Doctor Benjamin Rogers, Dean Aldrich (as distinguished in logic and in architecture as in music), Doctor Blow, Michael Wise, Pelham Humphrey, Henry Purcell, Doctor Croft, Doctor Greene, Doctor Boyce, Doctor Nares, Doctor Cooke, Battishill, after whom the art sank in character till it received new life from the infusion of the modern element by Attwood, coeval with whom was Samuel Wesley, and lastly to be noted are Sir John Goss, Doctor S. S. Wesley, Doctor Dykes (popular for his hymn-tunes), and Henry Smart, who bring the list down to recent personal remembrance. Well esteemed among living representatives of this department of music are Barnby, J. B. Calkin, Sir G. J. Elvey, Gadsby, Doctor Garrett, Doctor Gladstone, Doctor H. Miles, Doctor Hopkins, Doctor E. G. Monk, Doctor W. H. Monk, Sir F. A. G. Ouseley, Doctor Stainer, Doctor Steggall, Sir Arthur Sullivan, and E. H. Turpin, to which names many might be added.

Attention must now be directed to the natural as opposed to the artificial basis of music. Marin Mersenne had great love and much practical knowledge of music; he directed his profound learning and rare mathematical attainments to the investigation of the phenomena of sound; and his treatise, *Harmonie Universelle* (1636), first enunciated the fact that a string yields other notes than that to which its entire length is tuned. The discovery was extended by William Noble and Thomas Pigot, respectively of Merton and Wadham Colleges, Oxford, to the perception of the mode in which a string vibrates in sections, each section sounding a different note. The ancient musicians tested by calculation the few phenomena of sound then discovered rather than by observation of the principles these ex-

emplify. The measurement of major and minor tones was, after the distinction of perfect intervals, the subject dearest to their consideration, and it seems the furthest limit to which their knowledge attained. All the laws for melody, all the rules for counterpoint, were founded on this mathematical method.

Scientific discovery has seldom been made singly. When time has been ripe for the revelation of a phenomenon, several observers have coincidentally witnessed its existence, and simultaneously, or nearly, so displayed if not explained it to the world. In the instance under consideration, art foreran science, and its votaries continued the employment of harmonies which as yet could alone be justified by their beautiful effect, and even musical theorists did not for ages to come perceive the important, the all-powerful bearing of the principle of harmonics upon the subject they treated. What Mouton first ventured to write must be styled the starting-point of the modern in music, and one cannot too much marvel at the strong insight into the beautiful which those after-minds possessed—that, with no theory to guide, without star or compass, they made wider and wider application of the principle he had exemplified, and displayed in their works its utmost power of expansion. Three of the world's greatest musicians may be cited to show the force owned by genius of piercing to the utmost depth of a natural law, while having but their own delicate sense of propriety to restrain them within its bounds. Henry Purcell and his two colossal successors, George Frederic Handel (1685-1759) and Johann Sebastian Bach (1685-1750), wrote every combination of musical notes that down to our own latest times has ever been employed with good effect; and the more the works of these masters are studied the more are they found to foreshadow the supposed novelties in harmony employed by subsequent artists. This refers but to the technical materials of which their music is wrought; it is impossible in the present article to discuss fully the form and excellence of their works.

Handel's music has never, since he wrote, been wholly unknown or unloved, at least in England. He was engaged as a dramatic composer because of his Continental renown; this was immensely increased by the large number of Italian operas he wrote for the London stage, but, excellent of their kind as are these, the change of structure in the modern lyrical drama unfits the wonted witnesses of the works of the last hundred years to enjoy the complete performance of those of earlier time, and hence we hear but detached excerpts from any of them. It is upon Handel's oratorios and his secular works cast in the same mold that general knowledge of his mighty power rests, and these are a monument that cannot perish.

Bach was one of a very large family of musicians, who for two centuries practiced the art, in many instances with great success; the family glory culminated in him, and was scattered among his many sons, in whom it became extinct. Bach was a more assiduous student than either his predecessor or his contemporary who are here classed with him. It was later in life than they that he issued his earliest works, for his youthful renown was more as a player than as a producer. Having no theoretical instructor, he made searching study of all the music of earlier times and of his own.

The pianoforte may be styled the voice of the musician, the only means whereby unaided he can give complete utterance to his thoughts, the only vehicle for the communication of musical ideas in their entirety. This is not said in depreciation of other instruments of various excellence which have qualities impossible to the pianoforte, but has reference to the totality of musical speech that is possible, and to the convenience

with which this is produced on the instrument in question. The characteristic difference between this instrument and earlier ones of a similar class is that the strings of the pianoforte are struck by hammers impelled by the keys under the performer's finger, and yield louder or softer notes according to the force he uses, whereas its predecessors yielded variety of loudness only by mechanical instead of personal means, and hence were not the living exponents as it is of the executant's impulse. The term "*pian e forte*" is applied to a musical instrument by Paliarino or Pagliarini, a manufacturer of Modena, in 1598, but no particulars have reached us of its structure or effect. Some instruments which foreshadow the chief essentials of the modern pianoforte, made by Bartolomeo Cristofori, a Paduan then working in Florence, are described in letters of 1709, and must have been made some years earlier, and pianofortes by this ingenious inventor still exist bearing date 1720 and 1726. Marius, a Frenchman, submitted plans for an instrument with hammer action to the Académie Royale des Sciences in 1716, and Schröter, a German, claimed to have devised two models in 1717 and 1721; but the first pianofortes made away from Italy were by Gottfried Silberman in 1726, who worked from the designs of Cristofori.

Let us now revert to the opera, in which vast modifications were germinated toward the middle of the eighteenth century, and ripened before its close into noble maturity. At first wholly unregarded as a sphere for art uses, then admitted for interludial purposes in a fabrication styled *intermezzo* that was played between the acts of a serious composition, comedy became in course of time the basis of the most highly important, because the most comprehensive and truly the grandest, and further because the most especially musical, application of the art to dramatic ends. The class of writing here to be considered is that structure of concerted vocal music through which a continuous action proceeds, involving the embodiment of the characteristics of the several persons concerned, with their opposition and combination. Handel had been remarkably happy in uniting in one piece the utterances of three, four, and even five distinct persons; he did not, however, make these several individualities interchange speech in dialogue, but caused them to sing, as it were, so many monologues at once, each independent of the others, and Handel was not singular in his occasional practice though he was in his excellence. For some time this form of lyrical dramatic art was only applied to comic subjects; Paesello said to have been the first musician who introduced its use into serious opera; it reached perfection under the masterly touch of Mozart, whose two finales in *Figaro* and two in *Don Giovanni* are models which should be the wonder of all time and yet can never be approached.

Christoph Willibald Gluck (1714-1787) was a Bohemian by birth and a wanderer by habit. He was a grand reformer, or rather restorer, of dramatico-musical art, for he not only revived the principles enunciated in Florence on the threshold of the seventeenth century, which had been superseded by the vocalisms that had usurped the throne of truth, but he fully forestalled by this revival all that is good in what is nowadays denoted by the cant term "music of the future." As was the wont of his age, Gluck went to extend his art experience, perhaps to complete his education, to Italy, and there produced so many meritorious works in the style of the time as to establish a high reputation. This led to his engagement to write for the Italian Opera in London, whither he came in 1746. The work he composed for this occasion and one he then reproduced met with small favor, and a "*pasticcio*" from his previous works, *Piramo e Tisbe*, had no better fortune. Gluck there-

fore resolved to abandon the prevailing customs in writing for the stage, and to devise a system of dramatic composition wherein the musical design should grow out of the action of the scene, being ever dependent upon and illustrative of it, and yet being always a design faithful to the principles of what may be named musical architecture.

The origin, development, and supreme importance of the *symphony* next claim our attention. The term is and always has been used in Italy to define the instrumental preface, which elsewhere is called an overture, to a long vocal work. Handel and others, early in the eighteenth century, defined by it an instrumental piece incidental to such a work, generally depicting some supposed action, such as a battle, or a multitudinous entry. The term is also applied to the prelude and interludes in a single vocal piece of however small extent.

Haydn (1732-1809) is commonly styled the father of the symphony. If truly, then Carl Philip Emanuel Bach (1714-1788), the second of the many sons of the great Sebastian, stands as grandfather in the genealogy of that species of music; and its remoter ancestry may be traced to all but forgotten men in whose works is certainly a forecast of the plan above described. Haydn produced the marvelous number of 125 symphonies (some of them, indeed, were overtures for theatrical use), besides seventy-seven quartets for bowed instruments (the last one unfinished), fifty-two pianoforte sonatas, and pieces that are almost countless for various combinations of instruments; and in these one knows not whether to wonder more at the infinite fluency of melody or at the artistic mastery. In summing up the enormous amount of his works regard must also be given to his three oratorios, his fourteen masses, his operas, and his many detached pieces for one and several voices, and then it is hard to believe that all this can have been accomplished in a single life.

Next in chronology as a symphonist stands Mozart (1756-1791). Mozart wrote forty-eight symphonies, some of them in the tenderest years of childhood, and repeated the design in many chamber works for several or for a single instrument.

History now steps on to the great name of Beethoven (1770-1827), who in his nine symphonies, his six concertos (which are pieces on the same plan with the addition of a part for a solo instrument), and his priceless bequest of chamber music commands the world's adoration. It is the shallow practice of the present day to depreciate his two great predecessors, especially Mozart, in his favor; but comparative criticism is to ill purpose if it can only exalt one master by the dethronement of another. Beethoven enlarged the symphony, in some respects changed its character, and perhaps advanced its consideration; above all, after writing for awhile in the idiom of those two masters, he stamped his own individuality upon music. Let us delight in Beethoven—who can fail?—but let us also love Mozart and revere Haydn.

Next in time came Spohr (1784-1859), whose deliciously-phrased, rich-toned symphonies have lost regard in late years, but not beauty. Of his seven symphonies, four bear titles which refer them to an objective purpose; but they are still subjective, for the personality of the writer is expressed in every bar. Mendelssohn (1809-1847) did less but achieved more than Spohr; far less numerous, his instrumental writings for the concert-room and for the chamber have vitality and permanence which are not in those of the other master; they belong as much to hereafter as to now, while those of Spohr are already of the past. Schumann (1810-1856) has suffered through the persistence of his partisans in com-

paring him with another instead of displaying and extolling his own merit. Johannes Brahms is a worker in this class of art, who has planted his foot in the future and given warrant for transmitting to the coming generation the great model he received from the past, which, because of the masterpieces that have been cast in it, justly bears the name of classical. Cherubini (1760-1842) is the one Italian known to have written a symphony, and this work gives small reason for regret that it stands thus alone; he arranged the same as a violin quartet and wrote two original pieces of this class. Méhul (1763-1817) is the French representative of the symphonic art best known and best esteemed.

The Englishmen who have best succeeded in this highest form of music are Doctor Crotch (1775-1847), Cipriani Potter, J. Henry Griesbach (1798-1875), Henry Westrop (1812-1879), and Sterndale Bennett (1816-1875).

To have spoken of orchestral music compels notice of instrumentation as an element of the art that has high significance. It is analogous to coloring with the painter, being extra to the composition or plan of his work, but essential in vivifying and varying its effect. Its root is the appropriation of passages to the capabilities of instruments for which they are designed, and this is planted in the earliest as much as the latest essays in composition. Instrumentation may be styled the chemistry of sound, which by the synthesis of distinct tones produces new organisms; it is the blending of any of the rays of the musical prism which produces previously unheard colors. Mozart was the first to evince the very fine sense which perceives the parity and disparity of qualities, how some sounds will mix with and some will penetrate through others, how some instruments by pouring forth a stream of harmony may enrich or nourish a melody that floats on its surface in another quality of tone.

In two centuries instruments have undergone large modification, and their treatment has been modified accordingly. Writing for the harpsichord is widely different from that for the pianoforte, which also has been changed in character from generation to generation of composers, not only because of improvements in the manufacture of the instrument, but because of enlarged insight into its capabilities; hence the music of Emanuel Bach, Mozart, Dussek, Beethoven, Clementi, Cramer, Hummel, Moscheles, John Field, C. M. von Weber, Mendelssohn, Chopin, Schumann, Liszt, Thalberg, Sterndale Bennett, and Anton Rubenstein forms a continuous scale of development in aptitude and diversity. The transformation of the viol of various sizes into the violin, violoncello, and double bass of present use is a subject for special history, but its course is inseparably associated with the names of the great Cremonese manufacturers, Andrea Amati (1540), his two sons, and his grandson, the family Guarnerius, and Straduaris, who all practiced their craft as an art more than as a trade, setting each the stamp of his own genius on the instruments he produced and leaving models that have never yet been equaled. The extended resources of bowed instruments have come wholly through extended skill of executants, especially of Viotti, Rudolph, Kreutzer, Rode, Baillot, Paganini, Spohr, De Beriot, Molique, Ernst, Blagrove, Sivori, Sainton, Vieuxtemps, Joachim, and Carrodus on the violin; of Crosdill, Cervoletto, Lindley, and Piatti on the violoncello; and of Dragonetti and Bottesini on the double bass. The entire construction of flutes and reed instruments was changed by Theobald Boehm (1794-1881), and all makers now work upon his principle. Facilities have been increased on each of these classes of instruments, but on horns and trumpets modern use has in some respects diminished

them; that is, employing only notes of the harmonic scale, players of the time of Purcell, Handel, and Bach practiced so constantly in the upper register that they easily produced the twelfth harmonic and above this sometimes notes up to the eighteenth, and these they executed with volubility akin to that displayed on fingered instruments; it is now the custom to exercise the lips on the lower notes and on longer continued sounds, and hence the passages written by the elder masters are difficult to the verge of the impossible to present practitioners, and a totally different character distinguishes modern from earlier music for brass instruments. On the other hand, Charles Joseph Sax (1791-1865), and far more his son Adolph, have devised such systematic changes in the fabrication of all brass instruments as to give them an entirely new place in the orchestral category; by means of the pistons, of the sax-horns, cornets, and the like, these instruments yield the complete chromatic scale, which, superficially, appears to be an advantage; but, save for military bands, the alteration is a serious evil and has an incalculably pernicious effect upon the orchestration of the day.

A class of opera, defined in French as *opéra comique*, dates ostensibly from 1715. The definition is unsound, because, whatever the subjects of the first pieces so styled, it is often applied to works of a romantic, serious, or even tragic nature. The separation of this from the grand opera lies in the latter having music throughout, its rhythmical pieces being divided by accompanied recitative, while the *opéra comique* consists of music interspersed with spoken dialogue.

A new species of composition has sprung into being within these thirty years, which in France is defined as *opéra bouffe*, and in England as *comic opera*, but is totally distinct from the *opera buffa* of Italy or the *opéra comique* of France, while less unlike the *intermezzo* of Italian use in the eighteenth century. It may be described as burlesque, sometimes of stories that have held mankind's respect for ages, sometimes of modern social absurdities, but having the ridiculous for its main quality, and extravagant in every essential. It consists of an intermixture of lightest and most frivolous music with spoken dialogue, and depends as much on its literary sprightliness as on its musical tunefulness, for success. It may be said to have been originated by Offenbach (1819-1882) of Cologne, who settled in Paris when young, where in 1855 he engaged a theater for the production of his lyrical caricatures, initiated then with *Les Deux Aveugles*, and wrote in all sixty-nine pieces. He has several imitators in the country of his adoption, and is represented in England by Sir Arthur Sullivan.

During the last thirty years of his life, Wagner (1813-1883) strove to revolutionize the lyrical drama by his polemical writing, by his compositions for the theater, of which he is the twofold author of words and notes, and by his extraordinary means of bringing these conspicuously before the public. His principles were all gathered from antecedent reformers; their application was his own. His works of art are, by himself and his supporters, professed to be neither dramas nor music, but this cannot exempt them from dramatic and musical censure. The very remarkable commotion he has made in the world of art might be compared with that excited by the rivalry between Buononcini and Handel in London and that between Piccini and Gluck in Paris, but that these were in each instance the contention between one musician and another, whereas in the present case it is the opposition of one writer to all the musicians in the world, save the few members of the profession who, believing in the man, his doctrine, and his power to apply it, under-

take propagandism as a duty, and endeavor to make proselytes to their faith. Wagner's recent death has left judgment free as to his theoretical and practical merit; and a few years will determine the permanence or evanescence of his productions.

MUSIC-BOX, an instrument for producing by mechanical means tunes or pieces of music. The modern music-box is an elaboration of the elegant toy musical snuff-box in vogue during the eighteenth century. The notes or musical sounds are produced by the vibration of steel teeth, or springs cut in a comb or flat plate of steel. The teeth are graduated in length from end to end of the comb or plate, the longer teeth giving the deeper notes; and, where necessary, by filling or loading with lead the individual teeth are accurately attuned. Each tone and semitone in the scale is represented by three or four separate teeth in the comb, to permit of successive repetitions of the same note when required by the music. The teeth are acted upon and musical vibrations produced by the revolution of a brass cylinder studded with projecting pins, which, as they move around, raise and release the proper teeth at due intervals according to the nature of the music. An entire revolution of the cylinder completes the performance of the special pieces of music for which the apparatus is set, but upon the same cylinder there may be inserted pins for performing as many as thirty-six separate airs. This is accomplished by making both the points of the teeth or springs and the projecting pins which touch them very fine, so that a very small change in the position of the cylinder is sufficient to bring an entirely distinct set of pins in contact with the note teeth. In the more elaborate music-boxes the cylinders are removable, and may be replaced by others containing distinct sets of music. In these also there are combinations of bell, drum, cymbal, and triangle effects, etc. The revolving motion of the cylinder is effected by a spring and clock-work, and the rate of revolution is regulated by a fly regulator. The headquarters of the music-box trade is Geneva, where the manufacture gives employment to upward of 1,000 persons.

The music-box is a type of numerous instruments for producing music effects by mechanical means, in all of which a revolving cylinder or barrel studded with pins is the governing feature. The principle of the barrel operating by percussion or by wind on reeds, pipes, or strings governs carillons or music bells, barrel organs, mechanical flutes, celestial voices, harmoniphones, and the sometimes huge and complex orchestrons in which a combination of all orchestral effects is attempted. A principle of more recent introduction than the studded cylinder consists of sheets of perforated paper or card, somewhat similar to the Jacquard apparatus for weaving. The perforations correspond in position and length to the pitch and duration of the note they represent, and as the web or long sheet of paper passes over the instrument, the perforated holes are brought in proper position and sequence under the influence of the suction or pressure of air from a bellows, and thereby the notes are either directly acted on, as in the case of reed instruments, or the opening and closing of valves set in motion levers or liberate springs which govern special notes. The United States is the original home of the instruments controlled by perforated paper known as organettes, organinas, melodeons, etc.

MUSK, a substance of powerful and most enduring odor, is a secretion of the **MUSK DEER**, (*q.v.*) Three kinds of musk are distinguished in commerce, the most important and valuable being the Chinese or Tong-king musk, imported principally from Shanghai. It is put up in small, tin-lined, silk covered caddies, each contain-

ing from two to three dozen pods. These are generally adulterated to an enormous extent with dried blood, fragments of leather, leaden pellets, peas, etc., so that often little more than the smell of the original tenant of the pod remains.

Good musk is of a dark purplish color, dry, smooth, and unctuous to the touch and bitter in taste. It dissolves in boiling water to the extent of about one-half, alcohol takes up one-third of the substance, and ether and chloroform dissolve still less. A grain of musk will distinctly scent millions of cubic feet of air without any appreciable loss of weight, and its scent is not only more penetrating but more persistent than that of any other known substance.

MUSK-DEER, an animal belonging to the genus *Moschus*, of the section *Pecora*, a division of the *Artiodactyle Ungulates*, and allied to the Deer (*Cervidae*). In many respects it differs from the typical members of that group and stands by itself as an isolated zoological form, retaining characters belonging to the older and more generalized types of ruminants before they were distinctly separated into the horned and the antlered sections now dominant upon the earth. One of these characteristics is that both sexes are entirely devoid of any sort of frontal appendage.

Although, owing to variations of color presented by different individuals in different localities and seasons, several nominal species have been described, zoologists are now generally agreed that there is but one, the *Moschus Moschiferus* of Linnæus. In size it is rather less than the European roe-deer, being about twenty inches high at the shoulder. Its limbs, especially the hinder ones, are long. The feet are remarkable for the great development of the lateral pair of hoofs, and for the freedom of motion they all present, so that they appear to have the power of grasping projecting rocky points—a power which must be of great assistance to the animal in steadying it in its agile bounds among the crags of its native haunts. The ears are large, and the tail quite rudimentary. The hair covering the body is long, coarse, and of a peculiarly brittle and pith-like character, breaking with the application of an extremely slight force; it is generally of a grayish brown color, sometimes inclined to yellowish red, and often variegated with lighter patches. The Musk-deer has a wide distribution over the highlands of central and eastern Asia, including the greater part of southern Siberia, and extends to Kashmir on the southwest and Cochin-China on the southeast, always, however, at great elevations—being rarely found in summer below 8,000 feet above the sea-level, and ranging as high as the limits of the thickets of birch, rhododendron, and juniper, among which it mostly conceals itself in the daytime. It is a hardy, solitary, and retiring animal, chiefly nocturnal in its habits, and almost always found alone, rarely in pairs and never in herds. It is exceedingly active and surefooted, having perhaps no equal in traversing rocks and precipitous ground; and it feeds on moss, grass, and leaves of the plants which grow on the mountains among which it makes its home.

MUSKEGON, the county seat of the county of the same name, is a port of Michigan, fourteen miles from Grand Haven, at the junction of several important railroads. The town was settled in 1836, became a city in 1870 and had (1900) a population of 20,818. Its chief industry is the manufacture and shipment of lumber. The city contains a number of machine and boiler works, foundries, car-shops and other factories. It has numerous fine churches, a high school, opera-house, four newspaper offices and good schools.

MUSKELUNGE. See **PIKE**.

MUSK-OX. The animal commonly known by this

same, though approaching in size the smaller varieties of oxen, is in structure and habits closely allied to the sheep, its affinities being well expressed by the generic name *Ovibes* bestowed upon it by De Blainville.

The *Ovibes moschatus* about equals in size the small Welsh and Scotch cattle. The head is large and broad. The horns in the old males have extremely broad bases, meeting in the median line, and covering the brow and whole crown of the head. They are directed at first downward by the side of the face and then turn upward and forward, ending in the same plane as the eye. The ears are small, erect and pointed, and nearly concealed in the hair. The space between the nostrils and the upper lip is covered with short, close hair, as in sheep and goats, without any trace of the bare "muffle" of oxen. The greater part of the animal is covered with long brown hair, thick, matted and curly on the shoulders, so as to give the appearance of a hump, but elsewhere straight and hanging down—that of the sides, back and haunches reaching as far as the middle of the legs and entirely concealing the very short tail. There is also a thick woolly under-fur, shed in the summer. The hair on the lower jaw, throat, and chest is long and straight, and hangs down like a beard or dewlap, though there is no loose fold of skin in this situation as in oxen. The limbs are stout and short, terminating in unsymmetrical hoofs, the external being rounded, the internal pointed, and the sole partially covered with hair.

The Musk-ox is at the present day confined to the most northern parts of North America, where it ranges over the rocky barren grounds between the sixtieth parallel and the shores of the Arctic Sea. Its southern range is gradually contracting, and it appears that it is no longer met with west of the Mackenzie river, though formerly abundant as far as Eschscholtz Bay. Northward and eastward it extends through the Parry Islands and Grinnell Land to north Greenland, reaching on the west coast as far south as Melville Bay; and it was also met with in abundance by the German polar expedition of 1869–70 at Sabine Island on the east coast. No trace of it has been found in Spitzbergen or Franz Joseph Land.

MUSKRAT, a burrowing rodent, common in all parts of North America, and of habits somewhat similar to those of the beaver. Its fur is of some value as a substitute for the skin of that animal. The muskrat is very prolific. It is an awkward animal on land, but is very agile in the water, and it makes a nest or mound somewhat similar to that of the beaver.

MUSLIN, a term embracing the thin, delicate woven cotton fabrics, the lightest and most airy of all textures. The word is derived from Mosul; the original home of muslin-weaving is the East Indies, where even yet wonderful fabrics for airy lightness and delicacy continue to be woven with the aid of only the most rude and primitive appliances. The most delicate muslins are made at Dacca. Figured, embroidered, color-woven, and printed muslins are made at various places, principally in Madras province, and gold and silver printed muslins are made at Jeypore and Hyderabad in India. The making of muslin in Europe was first attempted at Glasgow by Robert Monteith about the year 1780, but he had to procure Indian bird-nest yarn for his web. The improvements in machinery effected about that time, however, soon enabled spinners to produce yarn of high counts, and thereafter the muslin trade took firm hold in the west of Scotland. In recent times the perfection of combing machinery, etc., has enabled spinners to supply yarn of much greater tenacity than has ever been spun in India, and indeed vastly finer than is of any use for weaving purposes.

MUSSCHENBROEK, PIETER VAN, natural philoso-

pher, was born at Leyden in March, 1692, and died in 1761.

MUSSEL, a term applied in England to two families of Lamellibranch Mollusks. The Sea Mussel (*Mytilus edulis*) belongs to the second order of the class *Lamellibranchia*, namely the *Heteromya*, in which the anterior or pallial adductor is much smaller than the pedal or posterior adductor. The byssus is a collection of horny threads by which the Sea Mussel (like many other lamellibranch or bivalve mollusks) fixes itself to stones, rocks, or submerged wood, but it is not a permanent means of attachment, since it can be discarded by the animal, which, after a certain amount of locomotion, again fixes itself by new secretion of byssus from the foot. Such movement is, however, very rare.

Mytilus edulis is an exceedingly abundant and widely distributed form. It occurs on both sides of the northern Atlantic and in the Mediterranean basin. It presents varieties of form and color according to the depth of water and other circumstances of its habitat.

The Sea Mussel is scarcely inferior in commercial value to the oyster. The freshwater Mussels, *Anodon cygneus*, *Unio pictorum*, and *Unio margaritifera*, belong to the order *Isomya* of lamellibranch mollusks, in which the anterior and posterior adductor muscles are equally developed.

MUSSELBURGH, a Scottish burgh of barony and regality, a municipal and parliamentary burgh in the parish of Inveresk and county of Midlothian, five and one-half miles east of Edinburgh. The population of the burgh in 1901 was about 9,000.

MUSSET, ALFRED DE, poet, play-writer, and novelist, was born on December 11, 1810, in Paris. His father, Victor de Musset, who in the course of his life held several ministerial posts of importance, traced his descent back as far as 1140. In Alfred's childhood there were various things which fostered his imaginative power. He and his brother Paul, who afterward wrote a biography of Alfred, delighted in reading old romances together, and in assuming the characters of the heroes of these romances. But it was not until 1826 that Musset gave any definite sign of the mental force which afterward distinguished him. Shortly after his first attempt in verse he was taken by Paul Foucher to Hugo's house, where he met Alfred de Vigny, Mérimée, and Sainte-Beuve. It was under Hugo's influence, no doubt, that he composed a play. The scene was laid in Spain, and some lines, showing a marked advance upon his first effort, are preserved. In 1828, when the war between the classical and the romantic school of literature was growing daily more serious and exciting, Musset, who had published some verses in a country newspaper, boldly recited some of his work to Sainte-Beuve, who wrote of it to a friend, "There is among us a boy full of genius." At eighteen years old Musset produced a translation, with a few insertions of his own, of De Quincey's *Opium-Eater*. This was published by Mame, attracted no attention, and has been long out of print. His first original volume was published in 1829 under the name of *Contes d'Espagne et d'Italie*, had an immediate and striking success, provoked bitter opposition, and produced many unworthy imitations. In 1833 Musset published the volume called *Un Spectacle dans un Fauteuil*. The success of the volume seemed to be small in comparison with that of his *Contes d'Espagne*, but it led indirectly to Musset's being engaged as a contributor to the *Revue des Deux Mondes*. In this he published, in April, 1833, *André del Sarto*, and he followed this six weeks later with *Les Caprices de Marianne*.

The appearance of *Les Caprices de Marianne* in the *Revue* was followed by that of *Rolha*, a marked symptom

of the "maladie du siècle." Then came the unfortunate journey which Musset made to Italy with George Sand. It is well known that the rupture of what was for a time a most passionate attachment had a disastrous effect upon Musset, and brought out the weakest side of his moral character. He was at first absolutely and completely struck down by the blow. But it was not so well known until Paul de Musset pointed it out that the passion expressed in the *Nuit de Décembre*, written about twelve months after the journey to Italy, referred not to George Sand, but to another and quite different woman. The story of the Italian journey and its results are told under the guise of fiction from two points of view in the two volumes called respectively *Elle et Lui* and *Lui et Elle*. During Musset's absence in Italy *Fantasio* was published in the *Revue*, and not long after his return *On ne badine pas avec l'Amour* appeared in the same way. In 1835 he produced *Lucie*, *La Nuit de Mai*, *La Quenouille de Barberine*, *Le Chandelier*, *La Loi sur la Presse*, *La Nuit de Décembre*, and *La Confession d'un Enfant du Siècle*.

In 1836 appeared, among other things, *Il ne faut jurer de Rien*, a comedy which holds, and is likely long to hold, the stage of the Théâtre Français, and the beginning of the brilliant letters of Dupuis and Cotonet on romanticism. In 1839 were published the *Caprice* (which afterward found its way to the Paris stage through, in the first instance, the accident of Madame Allan the actress hearing of it in a Russian translation) and some of the *Nouvelles*. In 1839 he began a romance called *Le Poète Déchu*, of which the existing fragments are full of passion and insight. In 1840 he passed through a period of feeling that the public did not recognize his genius—as, indeed, they did not—and wrote a very short but very striking series of reflections headed with the words "À trente Ans," which Paul de Musset published in his *Life*. In 1841 there came out in the *Revue de Paris* Musset's *Le Rhin Allemand*, an answer to Becker's poem which appeared in the *Revue des Deux Mondes*. This fine war-song made a great deal of noise, and brought to the poet quantities of challenges from German officers. Between this date and 1845 he wrote comparatively little. In the last-named year the charming "proverbe" *Il faut qu'une Porte soit ouverte ou fermée* appeared. In 1847 *Un Caprice* was produced at the Théâtre Français, and the employment in it of such a word as "rebonsoir" shocked some of the old guard of the old school. In 1848 *Il ne faut jurer de Rien* was played at the Théâtre Français, and the *Chandelier* at the Théâtre Historique. Between this date and 1851 *Bettine* was produced on the stage and *Carmosine* written; and between this time and the date of his death, from an affection of the heart, in May, 1857, the poet produced no large work of importance.

MUSTANG. The small wild horse of the Southwestern States and Mexico is known by this name. It is undoubtedly a reversion from domesticated stock, for there were no horses on the Northern Continent when European settlers arrived, although there is geological evidence of their early existence. Mustangs are of small size, not over thirteen hands in height, active, strong and shy, and useful as saddle-horses. They run wild in large herds and are secured by lassoing.

MUSTARD. The varieties of mustard-seed of commerce are produced from several species of the Cruciferous genus *Brassica*. Of these the principal are the Black or Brown Mustard, *Brassica nigra*, the White Mustard, *Brassica alba*, and the Sarepta-Mustard, *B. juncea*. The finest qualities of Black and White Mustard are cultivated in the eastern counties of England. The former is a plant requiring a rich soil and much

care in its treatment, but its seeds, which are very minute, weighing not more than one-fiftieth of a grain, are the most valuable for commercial purposes. The peculiar pungency and odor to which mustard owes much of its value are due to an essential oil developed by the action of water on two peculiar chemical substances contained in the black seed. These bodies are a compound termed by its discoverers myronate of potassium, but since called sinigrin, and an albuminoid body, myrosin.

Both as a table condiment and as a medicinal substance, mustard has been known from a very remote period. The form in which table mustard is now sold dates from 1720, about which time Mrs. Clements of Durham hit on the idea of grinding the seed in a mill and sifting the flour from the husk. The bright yellow farina thereby produced under the name of "Durham mustard" pleased the taste of George I., and rapidly attained wide popularity. As it is now prepared mustard consists essentially of a mixture of black and white farina in certain proportions. Several grades of pure mustard are made containing nothing but the farina of mustard-seed, the lower qualities having larger amounts of the white cheaper mustard; and corresponding grades of a mixed preparation of equal price, but containing certain proportions of wheat or starch flour, are also prepared and sold as "mustard condiment." The mixture is free from the unmitigated bitterness and sharpness of flavor of pure mustard, and it keeps much better.

MUTINY. This word, which primarily means a commotion and then an insurrection or sedition, is in English military law applied to a sedition in any forces belonging to Her Majesty's regular, reserve, or auxiliary forces, or navy. Such offenses are dealt with by courts-martial. For further details see **MILITARY LAW** and **COURT-MARTIAL**.

MUTTRA, a district in the lieutenant-governorship of the Northwestern Provinces, India, with an area of 1,453 square miles. The district consists of an irregular strip of territory lying on both sides of the Jumna. The general level is only broken at the southwestern angle by low ranges of limestone hills. The eastern half consists for the most part of a rich upland plain, abundantly irrigated by wells, rivers, and canals, while the western portion, though rich in mythological association and antiquarian remains, is comparatively unfavored by nature.

The census of 1901 returned the population of Muttra at about 750,000.

MUTTRA, chief town and administrative headquarters of the above district, is situated on the right bank of the Jumna, about thirty miles above Agra, with a population (1901) of 59,574.

MUZAFFARGARH, a district in the lieutenant-governorship of the Punjab, India, with an area of 3,136 square miles. It occupies the extreme southern apex of the Sind Sagar Doab, the wedge-shaped tract between the Indus and the Five Rivers or Panjnad. Population about 360,000.

MUZAFFARNAGAR or **MOZUFFERNUGGER**, a district in the lieutenant-governorship of the Northwestern Provinces, India, with an area of 1,656 square miles. It lies near the northern extremity of the Doab or great alluvial plain between the Ganges and the Jumna, and shares to a large extent in the general monotony of that level region. A great portion of the area is sandy and unfertile, but under irrigation the soil is rapidly improving and in many places the villages have succeeded in introducing a high state of cultivation. The census of 1901 returned the population at about 800,000.

MUZAFFARNAGAR, chief town and administrative headquarters of the above district, is situated on the military road from Meerut to Landaur. The population in 1881 was 15,080.

MUZAFFARPUR, or **MOZUFFERPORE**, a district in the lieutenant-governorship of Bengal, India, with an area of 3,004 square miles. The census of 1881 returned the inhabitants at 2,582,060.

MUZAFFARPUR, chief town and administrative headquarters of the above district, is situated on the right or south bank of the Little Gandak river, with a population 1900 was 16,080.

MUZAFFARPUR, or **MOZUFFERPORE**, a district in the lieutenant-governorship of Bengal, India, with an area of 3,004 square miles. The census of 1901 returned the inhabitants at 2,682,060.

MUZAFFARPUR, chief town and administrative headquarters of the above district, is situated on the right or south bank of the Little Gandak river, with a population (1901) of 45,400.

was situated in the northeast extremity of the fertile Argive plain. Its situation is exceedingly strong, and it commands all the roads leading from Corinth and Achaia into the Argive plain; this fact, combined with its distance from the sea, shows that the city was founded by a race which came from the direction of Corinth and not by immigrants landing on the coast. The walls of Mycenæ are the greatest monument that remains of the Heroic age in Greece; parts of them are similar in style and doubtless contemporary in date with the walls of the neighboring town Tiryns, but other parts seem to be the work of a rather later time. There can therefore be little doubt that the two towns were the strongholds of a single race, Tiryns commanding the sea-coast and Mycenæ the inner country. The city of Argos, on the other hand, has no remains to connect it with this early Mycenaean race; and legend tells of the rivalry between the dynasties of the Pelopidae at Mycenæ and of the Proetidae at Argos. The long warfare between the two cities lasted till 468 B.C., when Mycenæ was dismantled and its inhabitants dispersed. The city never revived; Strabo asserts that no trace of it remained in his time, but Pausanias describes the ruins.

Subjoined are the most important monuments. 1. The "Treasures" of Atreus and his sons, as Pausanias calls them. They were subterranean buildings of beehive shape, in the side of the hill southwest of the city; one of them is still almost perfect. A sloping passage, *δρόμος*, led to the doorway, with its ornamented columns, at the base of the building. The great circular chamber inside was probably covered with plates of bronze; a door in one side admitted to a second smaller chamber. Such buildings, which are found in other parts of Greece—e.g., Orchomenus, Sparta, Attica, Iolcus, etc.—were undoubtedly the sepulchers of noble families.

2. The graves discovered by Dr. Schliemann in 1876, within the city wall. They are inclosed within a circular *περίβολος* with a single entrance, and the place was therefore a holy place in the ancient Mycenaean time; on the other hand the part of the city wall which incloses them is a later addition to the original wall. At some period before 468 B.C. this addition was built; before that time the *περίβολος* was outside the wall. Some heroes of the race were worshiped here by the ancient inhabitants, but their names are not recorded by any trustworthy authority. In the time of Pausanias, six centuries after Mycenæ was destroyed, local legend maintained that these were the graves of Atreus, Agamemnon, Cassandra and her children, and Eurymedon; but it is uncertain whether this was the original legend, or a later tale that grew under the influence of Greek literature.

3. The Lion-Gate. The principal entrance to the city is approached by a *δρόμος*, flanked on each side by the city wall and leading up to a gateway. Over the entrance is placed a triangular slab of stone on which are carved two lions in relief; they are rampant, facing one another, but separated by an upright column. The art of this relief shows no resemblance to archaic Greek art; it is foreign in character, the work of an immigrant race, which brought with it a well-developed civilization.

Greek legend always maintains that the Pelopidae of Mycenæ came from Phrygia, and this is corroborated by the evidence of archaeology. The objects found in excavations, and the sculptured ornament on the doorways of the "Treasures" and over the Lion-Gate, all point to foreign influence and particularly to Asia Minor. The same type of the two lions and the column has been recently found over the entrance to a colossal sepulcher in the rocks near the southwestern corner of the Sangarius valley in Phrygia. Legend and remains alike show that a rich and powerful dynasty of foreign origin ruled at Mycenæ; the only early remains in the Greek world that equal them in interest are the ruins of ancient Troy.

MYDDLETON, SIR HUGH, the projector of the New River scheme for supplying London with water, was the sixth son of Richard Myddleton, governor of Denbigh Castle in the reigns of Edward VI., Mary, and Elizabeth, and was born about 1555. Myddleton worked silver and lead mines in Cardiganshire, and in this way obtained the practical knowledge of engineering which enabled him to put in operation his scheme for supplying London with water (see LONDON). In recognition of his services he was created a baronet by James I. in 1622; but pecuniarily the enterprise was a complete failure. Myddleton died December 10, 1631.

MYELITIS is a disease which by inflammation induces destructive changes in the tissues composing the spinal cord. In the *acute* variety the nerve elements in the affected part become disintegrated and softened, but repair may take place; in the *chronic* form the change is slower, and the diseased area tends to become denser (sclerosed), the nerve-substance being replaced by connective tissue. Myelitis may affect any portion of the spinal cord, and its symptoms and progress will vary accordingly. The chief causes of myelitis are injuries or diseases affecting the spinal column, extension of inflammation from the membranes of the cord to its substance (see MENINGITIS), exposure to cold and damp, and occasionally some pre-existing constitutional morbid condition, such as a fever. Any debilitating cause or excess in mode of life will act powerfully in predisposing to this malady. The disease is most common in adults.

MYNPOOREE. See MAINFURI.

MYRIAPODA. The Myriapoda or Centipedes are usually treated of in text-books as one of the classes of the group Arthropoda, being associated in that group with the Crustacea, Arachnida, and Insecta, as equivalent divisions of the animal kingdom. In consequence, however, of recent evidence which points to a community of origin of all the tracheate forms apart from that of the crustacea, it is probably more natural to divide the arthropoda (with the exception of certain minor groups of obscure affinities) into two classes, one consisting of the crustacea, the other of the tracheata. If this plan of classification be adopted, the Myriapoda form a sub-class of the tracheata.

MYRISTICA. See NUTMEG.

MYROBALANS. See LEATHER.

MYRON, one of the chief sculptors of the older Attic school, was born at Eleutherae, on the borders of Boeotia and Attica, and flourished in the middle of the

fifth century B.C. He was, like Phidias, a pupil of Ageladas of Argos. He worked almost exclusively in bronze; the only known exception is his wooden statue of Hecate at Ægina.

MYRRH is a gum-resin highly esteemed by the ancients as an unguent and perfume, used for incense in temples and also in embalming. The word is Semitic; it appears in the Old Testament as *Mor*, in Arabic as "morr." In Exod., "pure myrrh" should rather be "flowing myrrh," that is, the "myrrha stacte" of classical writers—the finest myrrh, according to Pliny, exuding without incisions in the bark. Myrrh was one of the gifts offered by the Magi, and a royal oblation of gold, frankincense, and myrrh is still annually presented by the queen on the feast of Epiphany in the Chapel Royal in London, this custom having been in existence certainly as early as the reign of Edward I. Until the present century the botanical source of myrrh was enveloped in great obscurity. In 1826 Ehrenberg brought home specimens of the myrrh trees found at Jízán on the east side of the Red Sea, and also on the neighboring mountains of Jara. The more recent investigations of Hildebrandt (1878) show that one of the plants brought home by Ehrenberg and named *Balsamodendron Myrrha* yields the true myrrh. It was found by Hildebrandt growing on sunny slopes of the Sarát mountains at an elevation of 1,600 to 3,200 feet. Myrrh is chiefly collected in the Somali country and in the neighborhood of Harar, southwest of Zeila, in the months of July and August, and is brought to the great fair of Berbera held in November, December, and January. Thence it is transported to Aden and shipped to Bombay, where it is sorted, the inferior kinds being sent chiefly to China and the finer sorts to Europe. Myrrh of the best quality is known as Turkey myrrh, and the inferior quality as East Indian myrrh, from being exported from Bombay. At the present time, however, all myrrh is imported either direct from Aden or from Bombay. The Somalis also cross over to the Arabian shore and collect this gum-resin on the hills about Shugra and Sureea to the east of Aden, where myrrh-trees abound.

As met with in commerce true myrrh occurs in pieces of irregular size and shape, from half an inch to two or three inches in diameter, and of a reddish-brown color. The transverse fracture has a resinous appearance with white streaks; the flavor is bitter and aromatic and the odor characteristic. It consists of a mixture of resin, gum, and essential oil in varying proportions from 23 to 44 per cent, the resin being present in good specimens to the extent of 27 per cent, and the oil from $\frac{3}{4}$ to 3 per cent. The resin appears to be a complex body, partly soluble in ether and partly in bisulphide of carbon. The gum is soluble in water and forms an adhesive mucilage. The odor of myrrh is due to the volatile oil, which is heavier than water. The bitterness is believed to be due to a glucoside, the chemical constitution of which has not been ascertained. It is obtained by treating with warm water the resin extracted by means of alcohol.

Myrrh is used in medicine at present chiefly as an auxiliary to other drugs, such as iron and aloes, in order to strengthen and modify their action.

MYRTLE. The *myrtus* of the Romans, and the Myrtle, *Myrtus communis*, of botanists, as now found growing wild in many parts of the Mediterranean region, doubtless all belong to one and the same species. It is a low-growing evergreen shrub, with opposite leaves varying in dimensions, but always small, simple, dark-green, thick in texture, and studded with numerous receptacles for oil. When the leaf is held up to the light it appears as if perforated with pin-hole-

owing to the translucency of these oil cysts. The fragrance of the plant depends upon the presence of this oil.

MYSIA, in ancient geography, was the name given to a province in the northwest of Asia Minor, which was bounded by Lydia and Phrygia on the south, by Bithynia on the northeast, and by the Propontic and Ægean Sea on the north and west. But its precise limits are very difficult to assign—the frontier on the side of Phrygia being, as observed by Strabo himself, very vague and fluctuating, while the northwestern corner of the province adjoining the Hellespont, was usually separated from Mysia under the name of the Troad, a district which was sometimes included in the name of Mysia, sometimes not.

MYSOKE or MAISÚR (*i.e.*, Mahesh-asura, "Buffalo-demon") is a native state in southern India, surrounded entirely by British territory, with an area of 27,936 square miles. The Mysore country above the Gháts, though frequently called "the tableland," is by no means flat or a plain, but is in some parts mountainous and everywhere undulating. Mysore is naturally divided into two regions of distinct character—the hill country, called the Malnád, on the west, and the more open country, known as the Maidán, comprising the greater part of the state, where the wide-spreading valleys and plains are covered with villages and populous towns. The drainage of the country, with a slight exception, finds its way into the Bay of Bengal, and is divisible into three great river systems—that of the Krishna, on the north, the Cauvery, on the south, and the Pennair, Penar, and Palar, on the east. The streams which gather from the hillsides and fertilize the valleys are embanked at every favorable point in such a manner as to form a series of reservoirs or tanks, the outflow from one at a higher level supplying the next lower, and so on all down the course of the stream at short intervals. These tanks, varying in size from small ponds to extensive lakes, are dispersed throughout the country to the number of 20,000; the largest is the Sulukere Lake, forty miles in circumference.

The census of 1901 returned the population of Mysore at 5,538,482. The population of the chief towns in the executive districts was as follows:—Bangalore (1901), 159,550; Mysore, 68,151; Shimoga, 12,040; Kolar, 11,172; Tumkú. 0,000; Chikmagalur, 7,088; Hassan, 5,950; and Chitalchoog, 4,271.

MYSOKE, the ancient capital of the above state, is situated ten miles southwest of Seringapatam, with a population of 68,151 in 1901. The town, which is spread over an area of about three square miles, lies at the foot of the Chámundi hill, in a valley formed by two parallel ridges running north and south. The streets generally are broad and regular, except in the fort. The majority of the houses are tiled, and some of them are substantial buildings two or three stories high. Altogether, the town has a clean and prosperous look, and its sanitary condition has been greatly improved of late years.

MYSTERIES. This name was applied to certain ceremonies in Greek religion which were esteemed peculiarly sacred and might not be freely spoken about. The subject is one of great difficulty on account of the absolute silence maintained with regard to it by many writers, and the guarded terms in which the few references to it are couched. The obligation to silence was not felt by the Christian writers, and it is to them that we owe most of our knowledge. Their testimony is of doubtful value, and it has been keenly debated whether any trust can be placed in it; but it is in such perfect accord with the few references in pagan authors that this skepticism is unjustifiable.

Of the many Mysteries which existed in different parts of Greece, the Eleusinian were the most famous, the most widely popular, the most representative in every way. In several parts of Greece—*e.g.*, at Phlius—there were Mysteries directly adopted from Eleusis; in other places, such as Lerna, Andania, etc., a genuine old mystic cultus was greatly modified by the same example. The Christian writers therefore direct their polemic mainly against the Eleusinian Mysteries, and the material for study is far less scanty in their case than in any other.

MYSTERY, or MIRACLE PLAY. See DRAMA.

MYSTICISM is a phase of thought, or rather perhaps of feeling, which from its very nature is hardly susceptible of exact definition. It appears in connection with the endeavor of the human mind to grasp the divine essence or the ultimate reality of things, and to enjoy the blessedness of actual communion with the Highest.

In the East, mysticism is not so much a specific phenomenon as a natural deduction from the dominant philosophic systems, and the normal expression of religious feeling in the lands in which it appears. Brahmanic pantheism and Buddhistic nihilism alike teach the unreality of the seeming world, and preach mystical absorption as the highest goal; in both, the sense of the worth of human personality is lost. India consequently has always been the fertile mother of practical mystics and devotees.

For opposite reasons, neither the Greek nor the Jewish mind lent itself readily to mysticism—the Greek, because of its clear and sunny naturalism; the Jewish, because of its rigid monotheism and its turn toward worldly realism and statutory observance. It is only with the exhaustion of Greek and Jewish civilization that mysticism becomes a prominent factor in Western thought. It appears, therefore, contemporaneously with Christianity, and is a sign of the world-weariness and deep religious need that mark the decay of the old world. Whereas Plato's main problem had been the organization of the perfect state, and Aristotle's intellect had ranged with fresh interest over all departments of the knowable, political speculation had become a mockery with the extinction of free political life, and knowledge as such had lost its freshness for the Greeks of the Roman empire. Knowledge is nothing to these men if it does not show them the infinite reality which is able to fill the aching void within. Accordingly, the last age of Greek philosophy is theosophical in character, and its ultimate end is a practical satisfaction. Neo-Platonism seeks this in the ecstatic intuition of the ineffable One. The systematic theosophy of Plotinus and his successors does not belong to the present article, except so far as it is the presupposition of their mysticism; but the mysticism of the medieval church is directly derived from Neo-Platonism through the speculations of the Pseudo-Dionysius.

MYTHOLOGY is the science which examines legends of cosmogony and of gods and heroes. Mythology is also used as a term for these legends themselves. Thus when we speak of "the mythology of Greece" we mean the whole body of Greek divine and heroic and cosmogonic legends. When we speak of the "science of mythology" we refer to the various attempts which have been made to explain these ancient narratives. Very early indeed in the history of human thought men awoke to the consciousness that their religious stories were much in want of explanation. The myths of civilized people, as of Greeks and the Aryans of India, contain two elements, the rational and the irrational. The rational myths are those which represent the gods as beautiful and wise beings. The Artemis of the *Odyssey* is a perfectly rational mythic representation of

a divine being. We feel, even now, that the conception of a "queen and huntress, chaste and fair," the lady warden of the woodlands, is a beautiful and natural fancy which requires no explanation. On the other hand, the Artemis of Arcadia, who is confused with the nymph Callisto, who, again, is said to have become a she-bear, and later a star, and the Brauronian Artemis, whose maiden ministers danced a bear-dance, are goddesses whose legend seems unnatural, and is felt to need explanation. Or, again, there is nothing not explicable and natural in the conception of the Olympian Zeus as represented by the great chryselephantine statue of Zeus at Olympia, or in the Homeric conception of Zeus as a god who "turns everywhere his shining eyes" and beholds all things. But the Zeus whose grave was shown in Crete, or the Zeus who played Demeter an obscene trick by the aid of a ram, or the Zeus who, in the shape of a swan, became the father of Castor and Pollux, or the Zeus who was merely a rough stone, or the Zeus who deceived Hera by means of a feigned marriage with an inanimate object, or the Zeus who was afraid of Attes, is a being whose myth is felt to be unnatural and in great need of explanation. It is this irrational and unnatural element—as Mr. Max Müller says, "the silly, senseless, and savage element"—that makes mythology the puzzle which men have so long found it.

The earliest attempts at a crude science of mythology were efforts to reconcile the legends of the gods and heroes with the religious sentiment which recognized in these beings objects of worship and respect. Closely as religion and myth are intertwined, it is necessary to hold them apart for the purposes of this discussion.

Later Explanations of Mythology.—The ancient systems of explaining what needed explanation in myths were physical, ethical, religious, and historical. One student, like Theagenes, would see a physical philosophy underlying Homeric legends. Another, like Porphyry, would imagine that the meaning was partly moral, partly of a dark theosophic and religious character. Another would detect moral allegory alone, and Aristotle expresses the opinion that the myths were the inventions of legislators "to persuade the many, and to be used in support of law." A fourth, like Eumelus, would get rid of the supernatural element altogether, and find only an imaginative rendering of actual history. When Christians approached the problem of heathen mythology, they sometimes held, with St. Augustine, a form of the doctrine of Eumelus. In other words, they regarded Zeus, Aphrodite, and the rest as real persons, diabolical, not divine. Some later philosophers, especially of the seventeenth century, misled by the resemblance between Biblical narratives and ancient myths, came to the conclusion that the Bible contains a pure, the myths a distorted, form of an original revelation.

Up to a very recent date students of mythology were hampered by orthodox traditions, and still more by ignorance of the ancient languages and of the natural history of man. Only recently have Sanskrit and the Egyptian and Chaldean languages become books not absolutely sealed. Again, the study of the evolution of human institutions from the lowest savagery to civilization is essentially a novel branch of research, though ideas derived from an unsystematic study of anthropology are at least as old as Aristotle. The new theories of mythology are based on the belief that "it is man, it is human thought and human language combined, which naturally and necessarily produce the strange conglomerate of ancient fable."

MYTILENE. See LESBOS.

MZENSK, another form of MTSRNSK, (*q.v.*)

N.

N denotes the dental nasal in all the languages in which our alphabet is used. But the sound which we call the dental nasal varies slightly in different languages according to the position of the point of the tongue. This may be pressed against the back of the teeth; and then we have a true "dental" sound. But the point of the tongue may also be placed not against the teeth but against the front part of the palate immediately behind the gums; and it is in this way that our English dentals are formed.

This same letter N, either alone or together with another letter, or distinguished by some diacritical mark, can be used for a much wider range of nasal sounds. It has been already pointed out (see letter M) that there are in every language as many nasals as there are clearly distinguished classes of sound produced at different parts of the mouth, *e.g.*, guttural or back-palatal, front-palatal, dental, labial, and others less easily apprehended. Each of these classes will have its nasal, which will vary from the sonant of the class only by the different position of the uvula: for the sonant (as, for example, *d*) the uvula is pressed up so as to cover the passage through the pharynx into the nostrils, and the voice therefore escapes wholly through the mouth; for the nasal (as for *n*) the uvula hangs down, so that the voice passes partly behind it through the nose, partly through the mouth; in all other respects the position of the vocal organs for *d* and *n* is just the same, and the material of the sound is the same, *i.e.*, breath made sonant by the vibration of the glottis. In an improved alphabet, therefore, we ought in each language to have several symbols for the nasals, as in Sanskrit, which had five different symbols. But no European language has more than two simple symbols; and, of these two, *m* is confined to one class, *viz.*, the labial; *n*, simple or modified, denotes the other sounds, and therefore often differs in different languages, and sometimes in the same language. It may also be employed to denote a wholly different class of sounds, as the nasalized vowels of the French.

NABATÆANS, a famous people of ancient Arabia, whose settlements in the time of Josephus gave the name of Nabatene to the border-land between Syria and Arabia, from the Euphrates to the Red Sea. The language of Josephus suggests, and Jerome, apparently following him, directly affirms, that the name is identical with that of the Ishmaelite tribe of Nebaioth, which in later Old Testament times had a leading place among the northern Arabs.

NABHA, or **NARBAL**, one of the Cis-Sutlej states in the Punjab, India, has an area of 928 square miles, with a population in 1901 of 285,000.

NABULUS, or **NABLŪS**. See **SHECHEM**.

NADĪM. Abulfaraj ibn Ishāk of Bagdad, known as Ibn abī Ya'kūb al-Nadīm (*ob.* 995 A.D.), is the author of one of the most interesting works in Arabic literature, the *Fihrist*, or "list of the books of all nations

that were to be found in Arabic," with notices of the authors and other particulars, carried down to the year 377 A.H. (987-88 A.D.). A note in the Leyden MS. places the death of the author eight years later. Of his life we know nothing; the name Nadīm belonged to a distinguished family of Persian origin.

NADIR SHAH. See **PERSIA**.

NADIYĀ, or **NUDDEA**, a district in the lieutenant-governorship of Bengal, with an area of 3,404 square miles. It is emphatically a district of great rivers. Standing at the head of the Gangetic delta, its alluvial surface, though still liable to periodical inundation, has been raised by ancient deposits of silt sufficiently high to be permanent dry land. Along the entire northeastern boundary flows the wide stream of the Padmā or Ganges; and all the remaining rivers of the district are offshoots of the great river. The census of 1901 returned the population at 2,217,847.

Rice is the staple crop, and there are four harvests in the year. Indigo is the chief export staple; but the district was the center of the indigo riots in 1860, and the industry then received a blow from which it has never recovered.

NÆVIUS, **GNÆUS**, is the second in order of time among the creators of Latin literature. He made his appearance as an author within five years after the first dramatic representation of Livius Andronicus; he was some ten or fifteen years older than Plautus, and preceded Ennius by a generation. As distinguished from Livius he was a native Italian, not a Greek; he was also a writer of original power, not a mere adapter or translator. If it was due to Livius that the forms of Latin literature were, from the first, molded on those of Greek literature, it was due to Nævius that much of its spirit and substance was of native growth.

He was not only the oldest native dramatist, but the first author of an epic poem—which, by combining the representation of actual contemporary history with a mythical background, may be said to have created the Roman type of epic poetry.

NÆVUS, a term in surgery signifying that form of tumor which is almost entirely composed of enlarged blood-vessels. There are three principal varieties:—(1) the capillary nævus, consisting of enlarged capillaries, frequently of a purplish color, hence the term "port-wine stain;" (2) the venous nævus, in which the veins are enlarged, of a bluish color; (3) the arterial nævus, in which there is a distinct pulsation, it being composed of enlarged and tortuous arteries. The nævus can be lessened in size by pressure. It is generally met with in the skin or immediately under the skin; sometimes it lies in the mouth in connection with the mucous membrane. It is often congenital, hence the term "mother's mark," or it may appear in early childhood. It often grows rapidly, sometimes slowly, and sometimes growth is checked, and it may gradually diminish in size, losing its vascularity and becoming fibrous and

non-vascular. This natural cure is followed by less deformity than a cure by artificial means. It is a good rule not to interfere unless the tumor is growing rapidly and at a rate out of proportion to the growth of the child.

NAGÁ HILLS, a district in the southeastern corner of the chief-commissionership of Assam, India, being a mountainous borderland between Nowgong district and Manipur state, with an area of about 6,400 square miles. It forms a wild expanse of forest, mountain, and stream.

NAGASAKI, or sometimes **NANGASAKI**, the leading seaport on the western coasts of Japan, is situated in the island of Kiu-shiu, and gives its name to a *ken* (province of Hizen or Hi-shiu). The harbor is formed by a beautiful inlet of the sea, stretching northward for a distance of about four miles, with an average width of about a mile, inclosed on both sides by a delightful framework of hills (1,500 feet), and adorned by a number of the most picturesque-looking islands. The city lies near the upper end of the inlet on its eastern side, extending about a mile in length and three-quarters of a mile in breadth. Immediately to the south, and connected with the mainland by a bridge, lies the half-artificial island of Desima (600 feet by 240), which, originally occupied by the Portuguese (1637-39), was for more than 200 years (1641-1854) the trading post and prison-house of the Dutch traders. Southward along the shore, on ground largely reclaimed from the sea, runs the foreign settlement, with the American, British, French, and Portuguese consulates on the hilly ground behind. The magnificent dock, commenced by the prince of Hizen in 1865, and rebuilt in 1874-79, occupies a deep gorge between two hills at Tatagami, on the western side of the firth opposite the city; a few hundred yards to the north of the dock are the engine-works of Akaonura (with an area of seven acres); and at Koski there is a fine patent slip constructed for the prince of Satsuma (the prince of Hizen's rival). Nagasaki is laid out with great regularity and neatness, the streets crossing each other at right angles; beginning to climb the hills, they not infrequently end in stairs. Among the public buildings may be mentioned the hospital established in 1861, the oldest in Japan, and the great government school, with its department for European languages and sciences, attended by hundreds of Japanese of all ages and ranks. Population, (1898), 107,422.

NAGINA, a town in Bijnaur district, Northwestern Provinces of India, is situated on the road from Hardwar to Muradábád, with a population of 20,503.

NAGOYA, sometimes **NOGOYA**, one of the largest and most active of the cities of Japan, the chief town of Aichi *ken* (province of Owari), and formerly the seat of the princes of Owari (one of the "three august families" closely allied to the Tokugawa line of Shoguns), lies at the head of the shallow Owari Bay, about thirty miles from Yokai-ichi, its port, with which it communicates by light-draught steamers. Nagoya is well known as one of the great seats of the pottery trade (though the master potters for the most part get their goods manufactured at Seto, about thirteen miles distant, where the clay has been worked for wellnigh two thousand years); fans and enamels are also made in the city. The population in 1898 was 244,145.

NÁGPUR, a district in the division of the same name, in the Central Provinces of India, with an area of 3,786 square miles. Nágpur district lies immediately below the great table-land of the Sápura range. The population in 1901 was 750,000. Of the area of 3,786 square miles, 1,863 were cultivated in 1882.

NÁGPUR, the chief town of Nágpur district, and the

administrative headquarters of the Central Provinces, India, is situated in the center of the district, on the banks of a small stream, the Nág. The population was 124,599 in 1901.

NAGY-KÖRÖS, (*i.e.*, Great Körös) is a town or rather an overgrown village, in Hungary, in the district and fifty miles to the southwest of Pesth. In 1900 it contained 24,769 inhabitants, chiefly Protestants.

NAGY-VÁRAD. See **GROSSWARDEIN**.

NAHARRO, **BARTOLOMÉ DE TORRES**, a Spanish dramatist of the period immediately preceding that of Cervantes and Lope de Vega, born at Torres in the neighborhood of Badajoz, was for some time a captive in Algiers, and after receiving his freedom visited the court of Leo X. at Rome. Here his satirical pen excited such hostility that he was compelled to fly to Naples, where he lived for some time under the protection of Fabricio Colonna, and where he published his *Propaladia* in 1517. He died in poverty and obscurity; the time and place are unknown.

NAHUM. "The book of the vision of Nahum the Elkoshite," which stands seventh among the minor prophets, is entirely directed against Nineveh, and predicts the utter destruction of the bloody and rapacious city, its empire, and its gods by the tardy but sure and irresistible vengeance of Jehovah.

NAIADS. See **NYMPHS**.

NAILS. A nail is a headed pin or spike of metal, commonly of iron. The primary and principal use of nails is in woodwork (joinery and carpentry), but they are also employed in upholstery, shoemaking, saddlery, slating, sheet-metal working, horseshoeing, and numerous other trades. The consumption in all civilized communities is enormous, but it is exceptionally great where timber houses and wooden erections generally prevail, as in the United States and in many British colonies. Size, form of head, nature of point, and special uses all give names to different classes of nails. Thus we have the names tacks, sprigs, and brads for very small nails; rose, clasp, and clout, according to the form of head; and flat points or sharp points, according to the taper of the spike. Arranged according to the manner in which they are manufactured, nails may fall into four principal classes:—(1) Ordinary or hand-wrought nails; (2) machine-wrought and cut nails; (3) wire or French nails; and (4) cast nails. The nailer handicraft was at one time a great industry in the country around Birmingham, and to this day in conjunction with chain-making it constitutes an important though declining trade. It is essentially a family industry, carried on in the meanest of workshops, with a very few simple blacksmith's tools and appliances. The nails are forged from nail-rods heated in a small smith's hearth, hammered on a low anvil, the nail length cut off on a chisel attached to the anvil, and the head formed by dropping the spike into a hole in a "bolster" of steel, from which enough of the spike is left projecting to form the head, which is variously flattened out. The head, in the case of clasp nails, is formed with two strokes of the hammer, while rose nails require four blows. The heads of the larger-sized nails are made with the aid of an "oliver" or mechanical hammer, and for ornamental or stamped heads "swages" or dies are employed. The conditions of life and labor among the hand nailers in England are exceedingly unsatisfactory; married women and young children of both sexes work long hours in small, filthy sheds attached to their dwellings, and their employment is controlled by middle-men or nail-masters, who supply them with the nail-rods and pay for work done, sometimes in money and sometimes in kind on the truck system. The handicraft is, however, an expiring industry, as machine-wrought and cut nails are rapidly supplanting most cor-

responding kinds of hand-made nails. Horse nails alone continue to be made in large measure by hand labor in England. The credit of perfecting machinery for the making of nails belongs to American inventors, and by numerous stages the nail-making machines have arrived at a high degree of efficiency. Of late years mild steel, such as the plates employed for shipbuilding, has been largely used for machine-made nails.

The machines turn out nails with wonderful rapidity, varying with the size of the nails produced from about 100 to 1,000 per minute. Wire or French nails are made from round wire, which is unwound, straightened, cut into lengths, and headed by a machine the same in principle as the pin-making apparatus (see PINS), but the pointing is accomplished by the pressure of dies in the same manner as the head is formed. Cast nails, which are cast in sand molds by the ordinary process, are used principally for horticultural purposes, and the hobnails or tacks of shoemakers are also cast.

NAIN, L.E. The three brothers Le Nain, who have of late attracted much attention, occupy a peculiar position in the history of French art. Although they figure among the original members of the French Academy, their works show no trace of the influences which prevailed when that body was founded. Their sober execution and choice of color recall characteristics of the Spanish school, and when the world of Paris was busy with mythological allegories, and the "heroic deeds" of the king, the three Le Nain devoted themselves chiefly to subjects of humble life such as *Boys Playing Cards*, *The Forge*, or *The Peasants' Noonday Meal*. These three paintings, together with others, among which is the noble *Procession in the Interior of a Church* (erroneously attributed to the Le Nain), are now in the Louvre. Their lives are lost in obscurity; all that can be affirmed is that they were born at Laon in Picardy early in the seventeenth century.

NAIRN, a small maritime county in the northeast of Scotland, is bounded west and south by Inverness, east by Elgin, and north by the Moray Firth. Its greatest length from north to south is about twenty miles, and its greatest breadth about fifteen miles; the area is 114,400 acres, or about 179 square miles. Population (1901), 9,291.

NAIRN, a royal and parliamentary burgh and county town, is situated near the Moray Firth, on the left bank of the Nairn, and on the Highland Railway, ninety-three miles west-northwest of Aberdeen and fifteen northeast of Inverness. Population, 4,665.

NAIRNE, CAROLINE OLIPHANT, BARONESS, the authoress of many fine Scotch songs, was born in Perthshire, August 16, 1766, and died in 1845.

NAKHICHEVAN, or NAKHJEVAN, a city of Russian Armenia, the chief town of a circle in the government of Erivan, is situated 100 miles southeast of Erivan and 267 miles from Tiflis. It occupies the brow of one of the last spurs of the Karabakh Mountains (Anti-Caucasus), and looks out over the wide and beautiful valley of the Araxes. Situated on the high road to Tabriz and Teheran, Nakhichevan is a seat of considerable transit trade. Population (1899) 7,000.

NAKHICHEVAN-ON-THE-DON, a town of southern Russia, situated in the government of Ekaterinoslaff, district of Rostoff, on the right bank of the Don. Owing to the fertility of the region, its advantageous situation for trade, and the privileges granted to the settlers, Nakhichevan soon became a wealthy place, and it still is the administrative center of the "Armenian district," which extends as a narrow strip along the banks of the Don, with a population of upward of 25,000.

NAMAQUALAND, a vast region of southwestern

Africa, extending along the west coast for a distance of 600 miles from the south of Damaraland, to the north of the county of Clanwilliam, and stretching inland from 80 to 350 miles. It is divided by the lower course of the Orange River into two portions—Little Namaqualand to the south, and Great Namaqualand to the north. Little Namaqualand, incorporated with Cape Colony since 1865, has an area of 20,635 square miles, and a population of 12,233, of whom 2,675 were whites. The seat of magistracy is at Springbokfontein, on a branch of the Buffels River, about sixty miles from the coast, with which it communicates by a mule-railway (ninety-six miles long), ending at Port Nolloth on Robbe or Seal Bay. Ookiep, six miles to the north of Springbokfontein, is, next to the diamond fields of Kimberley, the most important mining place in South Africa, its copper mines, giving employment to about 1,500 people; the output in 1882 was 16,311 tons of extremely rich ore. The European miners are mainly from Cornwall and Mansfield. Copper is also worked at Concordia, Spektakel, and (since 1853) Kodas. Great Namaqualand has an area of 987,000 square miles, but its population does not exceed 20,000, mostly Namaquas and other Hottentots (see HOTTENTOTS).

NAMES. Names, and the study of proper names of persons and places, are not without scientific and historical importance, but, on the whole, are perhaps rather matter of curious interest. It stands to reason, that, even in the earliest societies of "articulate speaking men," all known persons, places, and groups of human beings must have had names by which they could be spoken of and by which they were recognized. The study of these names and of their survival in civilization enables us in some cases to ascertain what peoples inhabited districts now tenanted by persons of far different speech.

The Romans have left us names connected with camps (castra, chesters) and military roads; the English have used simple descriptions of the baldest kind, or have exhibited their attachment to the idea of property; the Celtic names (like those which the red men have left in America, or the blacks in Australia) are musical with poetic fancy, and filled with interest in the aspects and the sentiment of nature. The Anglo-Saxon race carries with it the ancient names of an older people into every continent, and titles perhaps originally given to places in the British Isles by men who had not yet learned to polish their weapons of flint may now be found in Australia, America, Africa, and the islands of the furthest seas.

Local names were originally imposed in a handy local manner. The settler or the group of cave-men styled the neighboring river "the water," the neighboring hill "the peak," and these terms often still survive in relics of tongues which can only be construed by the learned. The history of personal names is longer and more complex, but proceeds from beginnings almost as simple. But in personal names the complexity of human character, and the gradual processes of tangling and disentangling the threads of varied human interest, soon come in, and personal names are not imposed once and for all. Each man in very early societies may have many names, in different characters and at different periods of his life. The oldest personal names which we need examine here are the names which indicate, not an individual, but a group, held together by the conscious sense or less conscious sentiment of kindred, or banded together for reasons of convenience. An examination of customs prevalent among the most widely separated races of Asia, Africa, Australia, and America proves that groups conceiving themselves to be originally of the same kin are generally styled by the name of some animal or

other object (animate or inanimate) from which they claim descent. This object is known as the "totem," from the Red-Indian word *dodhaim*. Of this topic it must here suffice to say that the earliest and most widely spread class and family names among uncivilized people are totemistic. Unmistakable traces of the same habit of naming exist among Semitic and Teutonic races, and even among Greeks and Romans. In addition to the totem names (which indicate, in each example, supposed blood-kindred), local aggregates of men received local names. We hear of the "hill-men," "the cave-men," "the bush-men," "the coast-men," the "men of the plain," precisely as in the old Attic divisions of Aktaioi, Pediaioi, and so forth. When a tribe comes to recognize its own unity, as a rule it calls itself by some term meaning simply "the men," all other tribes being regarded as barbarous or inferior. Probably other neighboring tribes also call themselves "the men," in another dialect or language, while the people in the neighborhood are known by an opprobrious epithet, as *Rakthasas* among the early Aryan dwellers in India, or *Eskimo* (raw-eaters) in the far north of the American continent.

Leaving tribal for personal names, we find that, among most uncivilized races, a name (derived from some incident or natural object) is given at the time of birth by the parents of each new-born infant. In most cases the name (the earliest name) denotes some phenomenon of nature; thus Dobrizhofer met in the forests a young man styled "Gold flower of day," that is "Dawn," his father having been named "Sun." Similar names are commonly given by the natives of Australia, while no names are more common among North-American Indians than those derived from sun, moon, cloud, and wind. The names of savage persons are not permanent. The name first given is ordinarily changed (at the ceremony answering to confirmation in church) for some more appropriate and descriptive nickname, and that, again, is apt to be superseded by various "honor-giving names" derived from various exploits. When society grows so permanent that male kinship and paternity are recognized, the custom of patronymics is introduced. The totem name gives place to a gentile name, itself probably a patronymic in form; or, as in Greece, the gentile name gives place to a local name, derived from the deme. Thus a Roman is called Caius; Julius is his gentile name (of the Julian clan); Cæsar is a kind of hereditary nickname.

This system of names answered the purposes of Greek and Roman civilization. In Europe, among the Teutonic races, the stock-names (probably totemists in origin) survive in English local names. Our English ancestors had for personal names compound words, as "Noble Wolf" (Ethelwolf), "Wolf of War," and so forth, and these names certainly testify to a somewhat primitive and fierce stage of society. Then came more vulgar nicknames and personal descriptions, as "Long," "Brown," "White," and so forth. Other names are directly derived from the occupation or craft (Smith, Fowler, Sadler) of the man to whom they were given, and yet other names were derived from places. The noble and landowner was called "of" such and such a place (the German *von*, and French *de*), while the humbler man was called not "of" but "at" such a place, as in the name "Attewell," or merely by the local name without the particle. If we add to these patronymics formed by the addition of "son," and terms derived from Biblical characters (the latter adopted after the Reformation as a reaction against the names of saints in the calendar), we have almost exhausted the sources of modern English and European names.

NAMUR, a province of Belgium, is bounded on the

north by South Brabant, on the east by Liège and Luxemburg, on the south by France, and on the west by Hainault, having a maximum length from north to south of fifty-five miles; its greatest breadth is forty-five miles, and the area 1,413 square miles. The surface is much varied by hill and dale, being traversed by the forest of Ardennes, which here attains a height of about 2,100 feet; in some parts, especially in the valley of the Meuse between Dinant and Liège, the scenery is beautiful and romantic. The principal rivers are the Meuse and its tributary the Sambre, which joins it at Namur. Geologically the province belongs to the Carboniferous system; the iron mines are very rich, and along with the coal-pits employ a considerable proportion of the industry of the province. Lead mines are also worked to some extent; and building-stone, slate, and excellent marble are quarried. At the 1900 census the population was 346,512. There are three arrondissements—Dinant, Namur, and Philippeville.

NAMUR (Flem., *Namen*), capital of the above province, is picturesquely situated on both banks of the Sambre, at the point of its junction with the Meuse, thirty-five miles southeast from Brussels. The population in 1900 was 32,223.

NANAK. See INDIA.

NANA SAHIB is the common designation of Dandhu Panth, adopted son of the ex-peshwa of the Mahrattas, Bâji Râo, who took a leading part in the great Indian mutiny, and was proclaimed peshwa by the mutineers. (See INDIA.) Nana Sahib was responsible for the massacres at Cawnpore, and was engaged in the protracted campaigns in Oudh. In the closing days of 1859, when the last remnants of the rebels disappeared over the Nepalese frontier, the Nana was among the fugitives. His death was reported some time afterward, but his real fate remains obscure.

NANCY, the ancient capital of Lorraine, afterward the chief town of the French department of Meurthe, and since 1872 that of the department of Meurthe-et-Moselle, is situated 219 miles east of Paris by railway, on the left bank of the Meurthe, six miles above its junction with the Moselle. It consists of two distinct portions: the old town in the northwest, between the citadel and the streets and square which bear the name of Stanislas, is composed of narrow and winding streets; the Stanislas town in the southeast has, on the other hand, wide, straight streets which cross each other at right angles and allow views of the hills around the city. Beyond the gates (several of which are preserved on account of their antiquarian interest, and still indicate the line of the old civic boundaries) long suburbs stretch out into the country. The railways from Paris to Strasburg skirt the city on the southwest side, and to the east and north lie the Meurthe and the canal from the Marne to the Rhine. Other railways—to Metz, to Epinal by Mirecourt, to Château Salins—join the main line in the neighborhood, and make the place an important junction.

Nancy is the seat of a bishop and of a court of appeal, and the headquarters of a military division dependent on the Châlons *corps d'armée*. It is also a university town, with the four faculties of medicine, literature, science, and law, and as an educational center has risen in importance since 1871. It possesses a large library, archives of antiquarian interest, a botanical garden and a museum of natural history, an academy, a geographical society, and an important school of forestry. The population was about 28,000 in the close of the eighteenth century, 43,000 in 1856, 52,000 in 1871, and 102,463 in 1901.

NANKING, or "the southern capital," is the name by which Keang-ning, the chief city in the province of

Keang-soo, in China, has been popularly known for several centuries. The present city dates only from the beginning of the Ming dynasty (1368), although it is built on the site of one which for more than two thousand years has figured under various names in the history of the empire. The more ancient city was originally known as Kin-ling; under the Han dynasty (206 B.C. to 25 A.D.) its name was converted into Tan-yang; by the T'ang emperors (618-907 A.D.) it was styled Keang-nan and Shing Chow; by the first sovereign of the Ming dynasty (1368-1644 A.D.) it was created the "southern capital" (Nan-king), and was given the distinctive name of Yang-t'een; and since the accession to power of the present Manchu rulers it has been officially known as Keang-ning, though still popularly called Nan-king.

But even when speaking of the city rebuilt by the Ming emperors it is necessary to use the past tense. The Taiping rebels, who carried the town by assault in 1853, made a clean sweep of all the national monuments and most of the more conspicuous public buildings it contained, and destroyed or were the means of destroying the greater part of the magnificent wall which surrounded it.

Nanking is about 194 geographical miles to the west of Shanghai, and is nearly equidistant between Canton and Peking. It is situated on the south bank of the Yangtze Keang, and has a population of 300,000 souls. In bygone days it was one of the chief literary centers of the empire, besides being famous for its manufacturing industries.

NANTES, a city of France, chief town of the department of Loire-Inférieure, is situated on the right bank of the Loire, thirty-five miles above its mouth. In population (128,349) it is the first city of Brittany. At Nantes the Loire receives on the left hand the Sèvre Nantaise, and on the right the Erdre, which forms the outlet of the canal between Nantes and Brest; and a large number of bridges spanning the various branches of the different streams join the several quarters of the city. Along the left bank of the Loire stretches an ever-extending line of factories and shipbuilding yards. In all there are six miles of quays, two and one-half miles traversing the city in its greatest breadth from east to west along the main river. The largest vessels at present come no farther than St. Nazaire, but a canal is being made on the left bank which will allow vessels drawing sixteen feet to come up to the city. Nantes lies 264 miles west-southwest of Paris by the Angers and Le Mans Railway, and 40 miles from St. Nazaire. Other lines connect with Rennes *via* Châteaubriant, La Roche-sur-Yon, Paimbœuf, and Pornic.

The cathedral of Nantes, commenced in 1434 in the Gothic style, is still unfinished. Its length will be, when completed, 335 feet, and the nave is 85 feet wide and 123 feet in height. The towers are 205 feet high.

Between the cathedral and the Loire, from which it is separated only by the breadth of the quay, stands the castle of Nantes, founded in the ninth or tenth century. Nantes possesses a fine theater, a court-house, a prefecture, and an exchange, which includes both the tribunal and the chamber of commerce. Besides two great hospitals—St. Jacques on the left bank of the Loire, with 1,600 beds, and Hôtel-Dieu, recently rebuilt in Gloriette island, with 1,200 beds—Nantes contains a deafmute institute, a secondary school of medicine and pharmacy, a hydrographic school, a drawing school, a branch establishment of the conservatoire at Paris, and a lyceum. It is the see of a bishop, and the headquarters of the eleventh *corps d'armée*. As a seat of the sugar manufacture Nantes stands next to Paris and Marseilles. In city or suburbs there are vast establish-

ments for the manufacture of iron, copper, and leather; shipbuilding yards, factories for agricultural and similar implements, oil-works, soap-works, a national tobacco factory employing 1,800 hands, and stained-glass factory, manure works, and granite yards.

NANTEUIL, ROBERT, a crayonist, and one of the most eminent of French line engravers, was born about 1623, or, as other authorities state, in 1630, the son of a merchant of Rheims. He died in 1678.

NANTICOKE, a flourishing manufacturing borough of Luzerne county, Pa., is situated in the Wyoming valley, eight miles from Wilkesbarre, on the North Branch of the Susquehanna. Its chief production is anthracite coal, of which it ships a million tons a year. Its population grew from 4,000 in 1880 to 12,116 in 1900.

NANTUCKET, an island, county, and town of the United States, forming (since 1693) part of Massachusetts. The island, with an area of about fifty square miles, lies within the ten-fathom line, but is separated from the mainland by Nantucket Sound, which measures from twenty-five to thirty miles in breadth, and has a general depth of from five to eight fathoms. Within the harbor the depth at low water is about twelve or fourteen feet, but on the bar it is only six or seven.

Nantucket (Natocko on the map of 1630) was visited by Gosnold (1602), who found it covered with oaks and other trees, and inhabited by about 1,500 Indians. The town of Nantucket (known as Sherburne from 1673 to 1795) was incorporated in 1671; the original site was at Maddequet, five or six miles west of the present position, to which it was removed in the following year. About the same time whaling operations were commenced, and Nantucket gradually became the greatest whaling station in the world. But since the beginning of the century its prosperity has rapidly declined. The last full-blood Indian in Nantucket died in 1821; the last half-breed in 1854. The population of the county was 4,500 in 1775, 9,013 in 1840, 6,094 in 1860, 4,123 in 1870, and 3,006 in 1900.

NANTWICH, a market-town of Cheshire, England, situated on two railway lines and on both sides of the Weaver, twenty miles southeast of Chester and thirty-six south-southwest of Manchester. Population, 8,000.

NAPA, the capital of Napa county, Cal., about thirty miles from San Francisco, with which it is connected by railroad. It has two banks, manufactures of machinery, plows, and boots and shoes, and a population (1900) of 4,036.

NAPHTALI, the son of Jacob by Bilhah, Rachel's maid, and uterine brother of Dan. The narrator of Gen. xxx. 8 explains the name Naphtali by the verb *naphthal* "wrestle." The seats of the tribe lay in the eastern half of Upper Galilee, a fertile mountainous country sloping down to the headwaters of Jordan and the Sea of Galilee.

NAPHTHA, a word originally applied to the limpid liquid portion of the petroleum which exudes abundantly at Baku, etc., on the shores of the Caspian Sea. Both in commerce and in science the term is now used somewhat vaguely, but more in a generic sense, to embrace several bodies having certain properties in common, than as a specific name for a particular substance. Naphtha indeed has no distinct place or meaning in modern chemistry. By the alchemists the word was used principally to distinguish various highly volatile, mobile, and inflammable liquids, such as the ethers—sulphuric ether and acetic ether having been known respectively as *Naphtha sulphurici* and *Naphtha aceti*. In recent times naphtha has been employed to indicate the volatile, limpid, inflammable hydrocarbons obtained by destructive distillation of organic substances artificially conducted, as well as those produced by similar agencies.

acting within the earth. In commerce the application of the term is still more restricted, and in general it embraces no more than the more volatile portion of the fluid hydrocarbons separated in the distillation of tar.

NAPHTHALINE. See TAR.

NAPIER, a seaport and borough of New Zealand, on the southeast coast of North Island, is the chief town of the province of Hawke's Bay, and is built on a peninsula (known as Scinde Island) about twelve miles from the southern end of the bay, about 200 miles by sea from Wellington. It is a thriving place, the center of a large agricultural and pastoral district. Population, 10,000.

NAPIER, SIR CHARLES, British admiral, was the second son of Captain the Hon. Charles Napier, R.N., and grandson of Francis, fifth Lord Napier, and thus cousin to the famous Napiers, Sir Charles, Sir George, and Sir William, and was born at Merchiston Hall, near Falkirk, on March 6, 1786. He became a midshipman in 1800, was promoted lieutenant in 1805, and commander in 1807, and distinguished himself in the West Indies, where he fought his famous action with three French ships of the line, and took the *Hautpoul*, seventy-four guns, into which the admiral promoted him captain. He spent some time at the university of Edinburgh, and then went to Portugal. In 1811 he served in the Mediterranean, and in 1813 on the coast of America and in the expedition up the Potomac. The first years of his leisure he spent in Italy and in Paris, but speculated so much in a steamboat enterprise that by 1829 he was quite ruined. In that year he was appointed to the *Galatea*, forty-two, and was at the Azores when they were held by the Count de Villa Flor for the queen of Portugal. He so much impressed the constitutional leaders that they begged him to take command of the fleet, which offer he accepted in February, 1833. With it he destroyed the Miguelite fleet off Cape St. Vincent on July 5, and on the demand of France was struck off the English navy list. Continuing his Portuguese services, he commanded the land forces in the successful defense of Lisbon in 1834, when he was made Grand Commander of the Tower and Sword, and Count Cape St. Vincent in the peerage of Portugal. On his return to England he was restored to his former rank in the navy in 1836, and received command of the *Powerful* in 1838. When troubles broke out in Syria he was appointed second in command, and distinguished himself by leading the storming column at Sidon on September 26, 1840, and by other services, for which he was made a K.C.B. He was promoted rear-admiral in 1846, and commanded the channel fleet from 1846 to 1848. On the outbreak of the Russian War he received the command of the fleet destined to act in the Baltic, but refused to attack Cronstadt. He was elected M.P. for Southwark in February, 1855, and retained his seat, though broken in health, until his death on November 6, 1860.

NAPIER, SIR CHARLES JAMES, was born at Whitehall, London, in 1782. After the custom of those times Charles Napier had been gazetted an ensign in the 33d regiment in 1794, and in 1797 his father secured for him the appointment of aide-de-camp to Sir James Duff, the general commanding the Limerick district. Moore speedily perceived the military qualities of the Napiers, and inspired the three elder brothers—Charles, George, and William—with an enthusiasm which lasted all their lives. Shortly after his return from Denmark the 50th was ordered to Portugal, and shared all the glories of the famous retreat to Coruña. Napier's life was saved by a French drummer named Guibert, who brought him safely to the headquarters of Marshal Soult. Soult treated him with the greatest kindness; and he was allowed by Ney to return to England to his "old blind mother" instead of being interned.

He had not been long in England when he heard that his exchange had been arranged, and, volunteering for the Peninsula, he joined the light division before Ciudad Rodrigo. As a volunteer he served in the actions on the Coa, and again at Busaco, where he was badly wounded. He was ordered to England, but refused to go, and was present with the light division in all the actions which took place during Wellington's pursuit of Maséna. His services were rewarded soon after by the lieutenant-colonelcy of the 102d regiment. He accompanied it in June, 1812, from Guernsey to Bermuda, where he wrought a wonderful change in the spirit of both officers and men. In September, 1813, he exchanged back into the 50th regiment, and in December, 1814, believing all chance of active service to be at an end, retired on half-pay. He was gazetted one of the first C.B.'s on the extension of the order in 1814, and was present as a volunteer at the capture of Cambray, though he just missed the great battle of Waterloo. Though an officer of some experience and more than thirty years of age, he now joined the military college at Farnham, and completed his military education. In 1819 he was appointed inspecting field officer at Corfu. From Corfu he was moved in 1822 to Cephalonia, where he remained for eight years as governor and military resident. An interesting episode in his command was his communication with Lord Byron when he touched at Cephalonia on his way to his death at Missolonghi, and the insurrection of the Greeks, who would have called him to be their commander-in-chief had the Greek committee in London encouraged his pretensions. In 1834 he refused the governorship of Australia, still hoping for military employment. In 1837 he was promoted major-general with his brother George, and in 1838 was made a K.C.B.; but he was to wait till 1839 before he received an offer of employment. In 1841 he resigned his command and went to India. He was stationed at Poona, and in September, 1842, when troubles were expected there, was ordered to Sind.

His command in Sind from 1842 till August, 1847, is the period of his life during which, according to his brother, he made good his title to fame, but his acts, more especially at first, have been most severely criticised. In fact there can be little doubt that from the moment he landed in the province he determined to conquer the ameers, and to seek the first opportunity of doing so. He was to be accompanied by Colonel Outram, who had been resident in Sind during the Afghan war, and who felt a great admiration for him, but who had also a warm affection for the ameers, and believed that he could put off the day of their destruction. On February 17, 1843, while Outram was still absent engaged in negotiation, Napier attacked the Baluch army 30,000 strong with but 2,800 men. With these 2,800 men, including the 22d regiment, which would do anything for him, he succeeded in winning the victory of Meanee. It was a battle of the olden type, in which generals had to fight like private. Sir Charles was in his element, and himself engaged in the fray. In the March following he finally destroyed the army of the ameers at the battle of Hyderabad. His success was received with enthusiasm both by the governor-general, Lord Ellenborough, and by the English people, and he was at once made a G.C.B. The conqueror of Sind now had an opportunity to prove his administrative powers, and proceeded to apply the same material means of civilization to Sind which had formerly been successful in Cephalonia. Whether or not the conquest of Sind at that particular period can be justified, there can be no doubt that Charles Napier was the best administrator who could be found for the provin

when conquered. The later years of his administration were made very stormy by the attacks on the policy of the conquest which had been made in England. He left Sind, after quarreling with every authority of the presidency of Bombay, and nearly every authority of the whole of India, in August, 1847, and received a perfect ovation on his return from all the hero-worshippers of the Napiers, of whom there were many in England. His short stay in England was occupied with incessant struggles with the directors of the East India Company; but, however much the directors hated him, it was not long before they had to beseech him in humble terms to become their commander-in-chief. The news of the indecisive victory of Chillianwalla created a panic in England, and the East India Company was obliged by the force of public opinion to summon Napier to take the command of its armies. Sir Charles started almost at a moment's notice, but on reaching India found that the victory of Gujrat had been won and the Sikh war was over. No taint of envy was in his nature, and he rejoiced that he had not to supersede Lord Gough in the moment of defeat. His restless and imperious spirit was met by one equally imperious in the governor-general, Lord Dalhousie. From the very beginning of his command the governor-general and the commander-in-chief disagreed, and in April, 1850, Sir Charles was reprimanded on some trifling point of discipline. The reprimand was reiterated by the duke of Wellington, and in December, 1850, Napier once more left for England. His constitution was undermined by the Indian climate, and especially by his fatiguing command in Sind, and on August 29, 1853, he died at Portsmouth.

NAPIER, JOHN, the inventor of logarithms, was born at Merchiston, near Edinburgh, in 1550, and was the eighth Napier of Merchiston. He died in 1617.

NAPIER, SIR WILLIAM FRANCIS PATRICK, was born at Cellbridge, near Dublin, on December 17, 1785. He became an ensign in the Royal Irish Artillery in 1800. He served in Denmark, and was present at the engagement of Kioge, and, his regiment being shortly afterward sent to Spain, he bore himself nobly through the retreat to Coruña. In 1809 he became aide-de-camp to his uncle in Ireland, but joined the 43d when ordered again to Spain. He was wounded on the Coa, and shot near the spine at Casal Nova. His conduct was so conspicuous during the pursuit of Masséna after he left the lines of Torres Vedras that he as well as his brother George was recommended for a brevet majority. He served with his regiment at the battles of the Nive, Orthes, and Toulouse. For his services he was made brevet lieutenant-colonel, and one of the first C.B.'s. Like his brother Charles he then entered the military college at Farnham. He commanded his regiment in the army of occupation in France until 1819, when he retired on half-pay. As it was impossible for him to live on his half-pay with a wife and family, he determined to become an artist, and took a house in Sloane street, where he studied with George Jones, the academician. The years he had spent in France he had occupied in improving his general education, for it will hardly be believed that the author of the *History of the War in the Peninsula* could not spell or write respectable English till that time. But his career was to be great in literature, not in art. The tendency appeared in an able review of Jomini in 1821, and in 1823 Mr. Bickersteth, afterward Lord Langdale, suggested to him the expediency of writing a history of the Peninsular War, in which he bore a part. In 1828 the first volume of the *History* appeared, and it was at once seen that the great deeds of that war were about to be fitly commemorated.

This success was due to a combination of qualities which have justly secured for Napier the title of being the best military historian England has produced. The best military histories have always been written by eyewitnesses. It is impossible for a new generation to analyze the military combinations and understand the minute facts which account for the winning or losing of a battle, though it may often unravel political intrigues which were veiled to the eyes of contemporaries. Napier added to this qualification a wonderful insight into the nature of war, and was alike to describe and understand the movements and feelings of the French as well as of the army in which he himself served. His admiration for Napoleon was only second to that for Sir John Moore, and he could feel for Soult in defeat as well as for Wellington in the hour of victory. When, in 1840, the last volume of the *History* was published, his fame not only in England but in France and Germany was safely established. In 1842 he was promoted major-general, and had given him the lieutenant-governorship of Guernsey. In 1845 he published his *History of the Conquest of Scinde*, and 1851 the corresponding *History of the Administration of Scinde*—books which in style and vigor rivaled the great *History*, but which, being written for controversial purposes, are not likely to maintain such an enduring popularity. He died in 1860.

NAPLES (Ital. *Napoli*, Gr. and Lat. *Neapolis*), formerly the capital of the kingdom of the Two Sicilies, and since 1860 the chief town of a province in the kingdom of Italy, is the largest and most populous city in the country, and disputes with Constantinople the claim of occupying the most beautiful site in Europe. It is situated on the northern shore of the Bay of Naples. It is distant 161 miles from Rome.

No other place in the world combines within the same compass so much natural beauty with so many objects of interest to the antiquary, the historian, and the geologist, as the Bay of Naples. It affords good anchorage, with nearly seven fathoms water, and is well sheltered, except from winds which blow from points between southeast and southwest.

On the northeast shore of the bay, east of Naples, is an extensive flat, forming part of the ancient *Campania Felix*, and watered by the small stream Sebeto and by the Sarno, which formerly flowed by Pompeii. From this flat, between the sea and the range of the Apennines, rises Vesuvius, at the base of which, on or near the seashore, are the town-like villages of San Giovanni Teduccio, Portici, Resina, Torre del Greco, Torre dell' Annunziata, etc., and the classic sites of Herculaneum and Pompeii. At the southeast extremity of the plain, three miles beyond the outlet of the Sarno, a great offshoot of the Apennines, branching from the main range near Cava, and projecting as a peninsula more than twelve miles west, divides the Bay of Naples from the Bay of Salerno, and ends in the bold promontory of the Punta della Campanella, which is separated by a strait of four miles from Capri. On the north slope of this peninsula, where the plain ends and the coast abruptly bends to the west, stands the town of Castellammare, near the site of *Stabia*, at the foot of Monte Sant' Angelo, which rises suddenly from the sea to a height of 4,722 feet. Farther west, and nearly opposite to Naples across the bay, are Vico, Meta, Sorrento, Massa, and many villages.

The city of Naples is built at the base and on the slopes of a range of volcanic hills, and, rising from the shore like an amphitheater, is seen to best advantage from the water. From the summit occupied by the castle of St. Elmo a transverse ridge runs south to form the promontory of Pizzofalcone.

The streets of Naples are generally well paved with lava or volcanic basalt, which, however, renders them both noisy and slippery for horses. The castle of St. Elmo, which dominates the whole city, had its origin in a fort erected by King Robert the Wise in 1343. The present building, with its rock-hewn fosses and massive ramparts, was conducted by Don Pedro de Toledo at the command of Charles V. in 1535, and was long considered practically impregnable. Damaged by lightning in 1857, it was afterward restored, but it is no longer used for defensive purposes. On a small island (I. del Salvatore, the *Megarís* of Pliny) now joined to the shore at the foot of the Pizzofalcone by an arch-supported causeway 800 feet long, stands the Castel dell' Ovo, which, dating from 1154, was for several centuries a place of great strength. Castel Nuovo, a very picturesque building constructed near the harbor in 1283 by Charles I. of Anjou, contains between the round towers of its façade the triumphal arch erected in 1470 to Alphonso I., and numbers among its chambers the Gothic hall of Giovanni Pisano in which Celestine V. abdicated the papal dignity. The royal palace, begun in 1600 by the Count de Lemos, from designs by Domenico Fontana, partly burned in 1837, and since repaired and enlarged by Ferdinand II., is an enormous building with a sea frontage of 800 feet, and a main façade 554 feet long and 95 feet high, exhibiting the Doric, Ionic, and Composite orders in its three stories. Naples is the see of a Roman Catholic archbishop, always a cardinal. The cathedral has a chapter of thirty canons, and of the numerous religious houses formerly existing thirteen have in whole or in part survived the suppression in 1868. The city is divided into 47 parishes, and there are 257 Roman Catholic churches and 57 chapels. Most of the churches are remarkable rather for richness of internal decoration than for architectural beauty. The cathedral of St. Januarius, occupying the site of temples of Apollo and Neptune, and still containing some of their original granite columns, was designed by Nicola Pisano, and erected between 1272 and 1316.

Of all the secular institutions in Naples none is more remarkable than the national museum, better known as the Museo Borbonico. The building, begun in 1886 for cavalry barracks, and remodeled in 1615 for the university, received its present destination in 1790. Enriched by the Farnese collection, by all that was most valuable in Naples, and by everything that would bear removal from Herculaneum, Pompeii, Stabiae, Puteoli, Paestum, etc., the museum is unique as a treasure-house of Roman and early Italian antiquities. The collection of Etruscan and Italo-Greek vases is unsurpassed. Nor is the variety of objects greater than the artistic value of some of the items—such as the Farnese Hercules, the Farnese Bull (Amphion and Zetus binding Dirce to its horns), the Dancing Faun (bronze), the statues of the Balbi (marble). For the rich libraries of Naples, see LIBRARY. The Club Alpino has a unique collection (25,000 volumes) of Vesuvian and seismographical literature.

The university of Naples is one of the oldest in Italy, having been founded by Frederick II. in the first half of the thirteenth century. It had fallen to insignificance under the Bourbons, but since 1860 it has rapidly recovered. In 1901, it had 81 instructors and 5,144 students.

There are about a score of theaters in Naples. The San Carlo opera-house, with its area of 5,157 square yards, and its pit capable of containing 1,000 spectators, is one of the largest in Europe.

The port of Naples is second in the kingdom. The total tonnage of foreign and coasting trade (entrance and clearance) had increased from 1,812,138 register tons in 1863 to 6,713,000 in 1900.

Naples has several good local springs (notably the Aqua del Leone at Margellina), a covered channel brings the waters of Monte Somma (Vesuvius) to the lower parts of the town; an aqueduct constructed in the seventeenth century at the cost of Criminello and Carmignano, taps the Isclero at Sant' Agata dei Goti, thirty miles distant; and a number of artesian wells have proved successful as far as quantity is concerned. But in spite of all these resources the water supply has long been far below the demand; and a city, which from its position might be one of the best-drained, cleanest, and healthiest in the world, has had an unenviable reputation for dirtiness and unwholesomeness. At present extensive works are in progress by which good drinking water is to be brought from Serino (nearly fifty miles distant) and laid on at three different high levels at the rate of 22,000,000 gallons daily for the use of the inhabitants and 1,000,000 for public purposes.

Naples, the most densely populated city in Europe, is slowly but steadily increasing. The commune—which includes not only the urban districts of S. Ferdinand, Chiaja, S. Giuseppe, Monte Calvario, Avvocata, Stella, San Carlo all' Arena, Vicaria, S. Lorenzo, Mercato, Pendino, and Porto, but also the suburban districts of Vomero, Posillipo, Fuorigrotta, Miano-Mianella, and Piscinola-Marianella—has advanced from 404,000 inhabitants in 1788 to 493,115 in 1881, and the city proper (the first twelve districts) from 326,130 in 1812 to 563,731 in 1901.

All ancient writers agree in representing Naples as a Greek settlement, though its foundation is obscurely and differently narrated. It seems that the oldest city on its site was founded by a colony from the neighboring Greek town of Cumæ. They are said to have given it the name of *Parthenope*, from a legendary connection of the locality with the siren Parthenope, whose tomb was still shown at the time of Strabo. A number of Chalcidic and Athenian colonists are reported to have afterward joined the original settlers, and to have built for themselves separate dwellings, which they called *Neapolis*, or the new city, in contradistinction to the old settlement, which in consequence was styled *Palæopolis*, or the old city. All modern attempts to define the respective extent and situation of Palæopolis and Neapolis have failed; but Livy's testimony leaves no doubt that they were close to each other and identical in language and government.

NAPOLEON I. The family Bonaparte (written by Napoleon's father and by himself down to 1796 Buonaparte, though the other spelling occurs in early Italian documents) was of Tuscan origin. A branch of it was settled in Corsica at least as early as the sixteenth century, from which time the Bonapartes appear as influential citizens of Ajaccio. They had an ancient title of nobility from the Genoese republic, and Napoleon's grandfather obtained letters of nobility also from the grand-duke of Tuscany. They had, therefore, the right to sign De Buonaparte, but ordinarily dropped the preposition of honor. Charles Marie de Buonaparte (born in 1746), studied law at the university of Pisa, where he took his doctor's degree in 1769, married at the age of eighteen Letitia Ramolino, who was not quite fifteen. The lady had beauty, but apparently neither rank nor wealth. Thirteen children were born, of whom eight grew up. The list is as follows: Joseph (king, first of Naples, then of Spain), Napoleone, Lucien, Eliza (Princess Bacciochi), Pauline (married, first to General Leclerc, afterward to Prince Borghese), Caroline (married to Murat, became queen of Naples), Louis (king of Holland), Jerome (king of Westphalia). Of these the eldest was born in 1768, the youngest in 1784. (See BONAPARTE.)

Besides his brothers and sisters, Napoleon raised to importance Joseph Fesch, half-brother of his mother, a Swiss on the father's side, who was afterward known to the world as Cardinal Fesch.

The accepted opinion is that Napoleon was born at Ajaccio on August 15, 1769. This opinion rests indeed on the positive statement of Joseph Bonaparte, but it is certain from documents that on January 7, 1768, Madame Letitia bore a son at Corte, who was baptized by the name of Napolione. And even in legal documents we find contradictory statements about the time and place of birth, not only of Napoleon, but also of Joseph. All difficulties disappear at once if we suppose that Napoleon and Napolione were one and the same, and that Joseph was really the second son, whom the parents found it convenient to pass off as the first-born. This they may have found convenient when, in 1779, they gained admission for a son to the military school of Brienne. A son born in 1768 would at that date be inadmissible, as being above ten years of age. Thus it is conceivable that Napoleon was introduced by a fraud so that military career which changed the face of the world. Nevertheless it is certain from Lucien's memoir that of such a fraud nothing was known to the younger members of the family, who regarded Joseph as without doubt the eldest.

After passing two or three months in a school at Autun for the purpose of learning French—he had hitherto been a thorough Italian—Napoleon entered Brienne on April 23, 1779, where he remained for more than five years, and then in September, 1784, passed, as "cadet-gentilhomme," into the military school of Paris. In the next year, 1785, he obtained his commission of lieutenant in the regiment La Fère, stationed at Valence. He had already lost his father, who, undertaking a journey to France on business, was entertained at Montpellier in the house of an old Corsican friend, Madame Permon, mother of the celebrated memoir-writer Madame Junot, and died there of the disease which was afterward fatal to Napoleon, on February 25, 1785, at the age of thirty-eight years.

The fact principally to be noticed about Napoleon's extraction and boyhood is that he was by birth a noble, needy provincial, and that from his tenth year his education was exclusively military. Of all the great rulers of the world none has been by breeding so purely a military specialist. He could scarcely remember the time when he was not a soldier living among soldiers. The effects of this training showed themselves too evidently when he had risen to the head of affairs. His character declared itself earlier than his talents. His abilities do not seem to have excited wonder, but he was studious, and in mathematics and geography made great progress. He never, however, so Carnot tells us, became a truly scientific man. He had neither taste nor talent for grammatical studies, but he was fond of books, and books of a solid kind.

He became a lieutenant of artillery in the service of Louis XVI. The next years were spent mainly with his regiment at Valence, Lyons, Douai, Paris, Auxonne, Seurre, Auxonne again. But he took long holidays with his family at Ajaccio, obtaining permission on the ground of ill-health. During this period he was principally engaged in authorship, being consumed by the desire of distinction, and having as yet no other means of attaining it. He produced *Letters on the History of Corsica*, which he proposed to dedicate first to Paoli, afterward to Raynal. Among his smaller compositions was *The Narrative of the Masked Prophet*.

Meanwhile his active life had begun with the Revolution of 1789. The first chapter of it is separate from the rest, and leads to nothing. That astonishing

career which has all the unity of a most thrilling drama does not begin till 1795. The six years which preceded it may be called his Corsican period, because for the greater part of it he may be thought to have regarded Corsica as the destined scene of his future life. In 1789 the Italian island of Corsica had been for twenty years a dependency of France. But France had acquired it in a most unscrupulous manner by purchasing the rights of the republic of Genoa over it. She did this in 1768, when Corsica had contested those rights in a war of nearly forty years, and had been practically independent for thirteen years under the dictatorship of Pasquale Paoli. It was an act similar to the partition of Poland, and seems to mark a design on the part of France—which had just lost its American colonies—to extend its power by way of the Mediterranean into the East. Paoli was compelled to take refuge in England, where he was still living when the French Revolution broke out.

The Revolution was as dangerous an event to the relation between France and Corsica as to that between France and St. Domingo. The islanders and the exiled Paoli at their head took a moderate view. France must guarantee a good deal of local freedom; on such conditions, they thought, the relations might continue, if only to prevent the republic of Genoa from reviving its pretensions. Accordingly, on November 30, 1789, Corsica was declared by the National Assembly to be a province of France, and the protest against this decree made by Genoa was treated with contempt. Paoli left London, was received in France with an ovation, appeared before the National Assembly on April 22, 1790, and landed in Corsica July 14th, after an absence of twenty-one years. Thus was Corsica reconciled to France by the Revolution of 1789; but the good work was undone by the Second Revolution of 1792.

Since 1769 the French power in the island had rested mainly on the noblesse and clergy. The Bonaparte family, as noble, had been on the unpatriotic side. It is therefore a remarkable fact that almost immediately after the taking of the Bastille Napoleon hurried to Ajaccio and placed himself at the head of the revolutionary party. He devoted himself to the establishment of a National Guard, of which he might hope to be the La Fayette, and he published a letter to Buttafuoco which, properly understood, is a solemn desertion of the principles of his family, similar to that of Mirabeau. This letter has also the intensity of his other early writings, but far more effectiveness. Had the opportunity offered, he might no doubt have stood forth at this time as the liberator of Corsica; but circumstances did not prove favorable, and he drifted gradually in the opposite direction.

In October, 1790, he met Paoli at Orezza, where Corsica constituted itself as a French department, Paoli being president. Paoli is said to have hailed Napoleon as "one of Plutarch's men." As the only Corsican officer trained at a royal military school, Napoleon might aspire to become commander of a paid native guard which it was proposed to create for the island. But France had misgivings about the use to which such a guard might be put, and the minister of war rejected the proposal. In the next year, however, he was successful in a second attempt to get the command of an armed force in Corsica, and betrayed in the course of this attempt how much more intent he was at this time upon Corsican than upon French affairs. It was decided to create four battalions of national volunteers for Corsica, and Napoleon became candidate for the post of lieutenant-colonel in the district of Ajaccio. The choice was in the hands of the volunteers themselves, and in

pursuing his canvass Napoleon did not hesitate to outstay his furlough, and thus forfeit his French commission by willful absence from a great review of the whole French army which was appointed for the opening day of 1792. He was, however, elected, having, it is said, executed the first of his many *coups d'état* by violently imprisoning a commissioner sent down to superintend the election.

He went to Paris, where he arrived on May 21st. The Second Revolution was at hand, and he could observe while no one had leisure to observe him. He witnessed August 10th and the downfall of the monarchy. On August 30th his name was restored to the army list with the rank of captain, a commission dated back to February 6th, and arrears of pay. He was saved from the most desperate condition to which he was ever in his whole life reduced. On September 2d he engaged in withdrawing his sister Eliza from St. Cyr (the House of St. Louis having been suppressed). The next step he took was remarkable. The great war which was to carry him to the pinnacle of fame was now in full progress. By undeserved good luck his military rank was restored to him. Now, instead of joining his regiment, he set off for Ajaccio, where he arrived on the 17th. The winter was spent in the unsuccessful expedition, which may be called Napoleon's first campaign, made from Corsica against the island of Sardinia. On his return he found a new scene opened. The Second Revolution was beginning to produce its effect in Corsica, which was no mere province of France, and in which everything was modified by the presence of Paoli. It might have been expected that Bonaparte, who all his life had glorified Paoli, and whose early letters are full of hatred to France, would have been an enthusiastic Paolist. But a breach seems to have taken place between them soon after Napoleon's return from Paris, perhaps in consequence of his escape of Easter, 1792. The crisis came on April 2d, when Paoli was denounced before the Convention, among others by Marat, and it was decreed that he and Pozzo di Borgo should come to Paris and render an account of their conduct to the Convention. Paoli refused, but with the remarkable moderation which characterized him offered to leave Corsica if his presence there appeared to the Convention undesirable. But the islanders rallied round him almost as one man.

There could be no reason why the horrors of the Second Revolution should extend to Corsica, even if we consider them to have been inevitable in France. For a Corsican patriot no fairer opportunity could offer of dissolving with universal approbation the connection with France which had begun in 1769. Napoleon took the opposite side. He stood out with Salicetti as the leading champion of the French connection and the bitterest opponent of Paoli. Paoli summoned a national consulta at the end of May, and the dissolution of the French connection now began. The consulta denounced the Bonaparte family by name. Napoleon answered by desperate attempts to execute his old plan of getting possession of the citadel of Ajaccio. But he failed, and the whole Bonaparte family, with Madame Letitia and Fesch, pursued by the fury of the people, took refuge in France. With this hejira the first period of Napoleon comes to an end.

It was in June, 1793, that the Bonaparte family found themselves at Toulon in the midst of the Corsican emigration. France was in a condition not less disturbed than Corsica, for it was the moment of the fall of the Girondins. Plunged into this new party strife, Bonaparte could hardly avoid taking the side of the Mountain. Paoli had been in a manner the Girondin of Corsica, and Bonaparte had headed the opposition to him.

Marseilles had declared against the Convention, and had sent an army under Rousselet which had occupied Avignon, but had evacuated it speedily on being attacked by the troops of the Mountain under Carteaux. Bonaparte took part in the attack, commanding the artillery, but it seems an unfounded statement that he specially distinguished himself.

Bonaparte marched with Carteaux into Marseilles late in August, and about the same time Toulon delivered itself into the hands of the English. Just at this moment he was promoted to the rank of *chef de bataillon* in the second regiment of artillery, which gave him practically the command of the artillery in the force which was now formed to besiege Toulon. The story of his relations with the generals who were sent successively to conduct the siege, Carteaux the painter, Doppet the physician, Dugommier the brave veteran, and of his discovery of the true way to take Toulon, are perhaps somewhat legendary, but he may probably have been eloquent and persuasive at the council of war held November 25th, in which the plan of siege was laid down. That he distinguished himself in action is more certain, for Dugommier writes, "Among those who distinguished themselves most, and who most aided me to rally the troops and push them forward, are citizens Buona Parte, commanding the artillery, Arena and Cervoni, adjutants general." He was now named general of brigade.

Bonaparte now passed out of the civil into the foreign war. The military system of the Convention was by this time in full operation. Distinct armies faced each enemy, and the great military names of the Revolution were already in men's mouths. Bonaparte joined the army of Italy as general of artillery and inspector-general; to the same army was attached Masséna as general of division; Dumerbion was general-in-chief. It is then that for the first time Bonaparte's exceptional ability was remarked. In the brief campaign of the army of Italy which occupied the month of July, 1794, he took no part, while Masséna commanded in the illness of Dumerbion. But in July he made his first essay in diplomacy. Genoa was among the earliest of the many feeble neutral states which suffered in the conflict of the Revolution with the great powers, and at the expense of which the revolutionary empire was founded. Bonaparte was sent by the younger Robespierre to remonstrate with the Genoese Government upon the use which they suffered the Coalition to make of their neutral territory. He was in Genoa from July 16th to July 23d; he urged the French claim with success; he returned to Nice on July 28th. Probably the connection of Bonaparte with the Robespierres was closer than Bonaparte himself at a later time liked to have it thought. Accordingly after Thermidor the Representatives who remained with the army of Italy, viz., Salicetti, Albitte, and Laporte, suspended Bonaparte from his functions, and placed him provisionally under arrest (August 6th). He was imprisoned at the Fort Carré near Antibes, but fortunately for him was not sent to Paris. On the 20th he was set provisionally at liberty on the ground of "the possible utility of the military and local knowledge of the said Bonaparte."

His escape was due, according to Marmont, to Salicetti's favor and to the powerful help he himself succeeded in procuring; "he moved heaven and earth." His power of attaching followers also now began to appear; Junot and Marmont, who had become acquainted with him at Toulon, were prepared, if he had been sent to Paris, to set him free by killing the *gens d'armes* and carrying him into the Genoese territory. This was a passing check; early in 1795 he suffered a greater misfortune. He had been engaged in a maritime expedition

of which the object was to recover Corsica, now completely in the power of the English. On March 3d he embarked with his brother Louis, Marmont, and others on the brig *Amitié*. On the 11th the fleet set sail. It fell in with the English, lost two ships, and returned defeated. The enterprise was abandoned, and by the end of the same month we find Lacombe Saint Michel, member of the Committee of Public Safety, sending orders to the general of brigade Bonaparte to proceed immediately to the army of the west in order to take command of the artillery there. He left Marseilles for Paris on May 5th.

On his arrival at Paris he avoided proceeding to the army of the west, and after a time obtained from Doucet de Pontécoulant a post in the topographical section of the war office. Here he had an opportunity of resuming his old work, and we find him furnishing Doucet, as he had before furnished Robespierre junior, with strategical plans for the conduct of the war in Italy. Late in August he applied for a commission from Government to go to Constantinople at the head of a party of artilleryists in order to reform that department of the Turkish service. At this moment occurs the crisis of his life. It coincided with a remarkable crisis in the history of France.

The Second Revolution (1792) had destroyed the monarchy, but a republic, properly speaking, had not yet been established. Between 1792 and 1795 the government had been provisionally in the hands of the National Convention, which had been summoned, not to govern, but to create a new constitution. Now at length, the danger from foreign enemies having been averted, the Convention could proceed to its proper work of establishing a definite republic.

There was danger lest the country, when appealed to, should elect to undo the work of 1792 by recalling the Bourbons, or at least should avenge on the Mountain the atrocities of the Terror. To preserve the continuity of government an expedient was adopted. As under the new constitution the assemblies were to be renewed periodically to the extent only of one-third at a time, it was decreed that the existing Convention should be treated as the first Corps Législatif under the new system. Thus, instead of being dissolved and making way for new assemblies, it was to form the nucleus of the new legislature, and to be renewed only to the extent of one-third. This additional law, which was promulgated along with the new constitution, excited a rebellion in Paris. The sections (or wards) called into existence a revolutionary assembly, which met at the Odéon. This the Convention suppressed by military force, and the discontent of the individual sections was thereby increased. At the same time their confidence was heightened by a check they inflicted upon General Menou, who, in attempting to disarm the section Lepelletier, was imprisoned in the Rue Vivienne, and could only extricate himself by concluding a sort of capitulation with the insurgents. Thereupon the Convention, alarmed, put Menou under arrest, and gave the command of the armed forces of Paris and of the army of the interior to Barras, a leading politician of the day, who had acquired a sort of military reputation. Barras knew the army of Italy and the services which Bonaparte had rendered at Toulon, and nominated him second in command.

It does not seem that Bonaparte showed any remarkable firmness of character or originality of genius in meeting the revolt of the sections on the next day (Vendémiaire 13th, *i.e.*, October 5th) with grapeshot. The disgrace of Menou was a warning that the Convention required decisive action, and the invidiousness of the act fell upon Barras, not upon Bonaparte. Indeed in the

official report drawn by Bonaparte himself his own name scarcely appears; instead of assuming courageously the responsibility of the deed, he took great pains to shirk it. He appeared in the matter merely as the instrument, as the skillful artilleryist, by whom Barras and the Convention carried their resolute policy into effect. In this affair he produced an impression of real military capacity among the leading men of France, and placed Barras himself under a personal obligation. He was rewarded by being appointed in succession to Barras, commander of the army of the interior. In this position, political and military at the same time, he preluded to the part reserved to him later of First Consul and Emperor. He also strengthened his new position materially by his marriage with Josephine de Beauharnais, née Tascher. Josephine was prominent in Parisian society, and for the lonely Corsican, so completely without connections in Paris, or even in France, such an alliance was of priceless value. The act of marriage is dated Ventôse 10, year IV. (*i.e.*, March 9, 1796). On this day Bonaparte had already been appointed to the command of the army of Italy. His great European career now began.

The fourth year of the Revolutionary War was opening. The peculiar characteristic of that war is that, having been for France, at the commencement, a national war of liberation on the grandest scale, it changed its character after two years and became an equally unprecedented national war of conquest. The conquest of Austrian Flanders had been made in 1794, that of Holland in the winter of the same year. The whole left bank of the Rhine was in French occupation, and the war had passed over to the right bank. The question was no longer of the principles of the Revolution, but only of inducing the emperor and the Germanic body to conclude treaties in which Belgium and the left bank should be ceded. Prussia, with most of the North-German princes and Spain, had retired from the war early in 1795. Austria was now the great enemy of France by land. Accordingly the direct struggle was waged chiefly on the upper Rhine, where Austria had then extensive territories.

But not only Austria could be attacked in Italy. The French Revolution, by undertaking a sort of crusade against monarchy, had furnished itself with a justification for attacking almost all states alike, for almost all were either monarchical or at least aristocratic. Italy was full of small states which could be attacked as Mainz or Holland had been attacked before. Bonaparte instinctively saw that he had a charter for indiscriminate conquest and plunder. He announced this to the army without the least disguise: "Soldiers, you are naked and ill fed; I will lead you into the most fruitful plains in the world. Rich provinces, great cities will be in your power. There you will find honor and fame and wealth!"

This order of the day was issued from Nice, where Bonaparte had arrived on March 27th. The campaign began on April 10th. This, the first of Bonaparte's campaigns, has been compared to his last. As in 1815 he tried to separate Blücher and Wellington, hoping to overcome them in turn, so now with more success he attacked first the Austrians under Beaulieu and then the Sardinians under Colli. Defeating the Austrians at Montenotte, Millesimo, and Dego, he turned on the 15th against Colli, defeated him at Ceva, then at Mondovì, and concluded the convention at Cherasco on the 28th. By this convention, which was soon after turned into a treaty of peace, Sardinia was severed from the Coalition, and her principal fortresses put into the hands of France. What Bonaparte had so long dreamed of he accomplished in a single month, and turned himself at once to the conquest of Lombardy.

The month of May was devoted to the invasion. On the 7th he crossed the Po at Piacenza, stormed the bridge over the Adda at Lodi on the 11th, and, as the archduke who governed Lombardy had quitted Milan on the 9th, retiring by Bergamo into Germany, Bonaparte entered Milan on the 15th. That day Bonaparte told Marmont that his success hitherto was nothing to what was reserved for him. June was spent in consolidating the conquest of Lombardy, in spoiling the country, and repressing the insurrections which broke out among the Italians, astonished to find themselves plundered by their "liberators." From the middle of July the war, as far as Austria was concerned, became a war for Mantua. Austria made desperate and repeated efforts to raise the siege of that all-important fortress. On July 29th Würmser arrived at the head of 50,000 men, making his way through Tyrol from the Rhine. He advanced on both sides of the Lake of Garda, and threatened Bonaparte's communications by occupying Brescia. Bonaparte abandoned the siege of Mantua, and brought his whole force to meet the enemy.

At the end of October Austria had assembled a new army of 50,000 men. They were placed under the command of Alvinzi. Bonaparte was to be overwhelmed between this army and that of Würmser issuing from Mantua. But by a night march he fell upon Alvinzi's rear at Arcola. The struggle lasted through three days, during which Bonaparte's life was at one moment in great danger, and ended in complete victory for the French (November 15-17). From Arcola he used ever afterward to date his profound confidence in his own fortune.

The commander of a victorious army wields a force which only a government long and firmly established can hold in check. A new government, such as the Directory in France, having no root in the country, is powerless before a young victor such as Bonaparte. The danger had been early perceived; Hoche had been pronounced dangerous by Robespierre; it became imminent when Bonaparte with his unrestrained ambition pushed before the other generals. The *coup d'état* of Brumaire was in Bonaparte's mind before he had been many weeks at the head of the army of Italy. But long before he ventured to strike the existing government we see that he had completely emancipated himself from it, and that his acts were those of an independent ruler, as had been those of Caesar in Gaul or of Pompey in the East while the Roman republic was still nominally standing.

From the outset it had been contemplated to make the invasion of Italy financially profitable. Contributions were levied so rapaciously that in the duchy of Milan, where the French had professed to appear as brothers and liberators, a rebellion against them speedily broke out, which Bonaparte suppressed with the merciless cruelty he always showed in such cases. He kept the promise of his first proclamation: he made the army rich.

As he made himself financially independent of the Government, so he began to develop an independent policy. Hitherto he had had no politics, but had been content to talk the Jacobinism of the ruling party; now he took a line, and it was not quite that of the Government. He had already, in June, 1796, invaded the papal territory, and concluded a convention at Bologna by which he extorted \$3,000,000 from the pope; immediately after the fall of Mantua he entered the States of the Church again, and concluded the treaty of Tolentino on February 19th. Now in dealing with the pope he separated his policy from that of the Directory. He demanded indeed the cession of Bologna, Ferrara, and the Romagna, besides Avignon and the Venaissin, and the temporary cession of Ancona. But he recognized

the pope by treating with him, and toward the Catholic religion and the priesthood he showed himself unexpectedly merciful. Religion was not to be altered in the ceded Legations, and Bonaparte extended his protection in the most ostentatious manner to the *prêtres insermentés*, whom he found in large numbers in the States of the Church. His manner of conducting the war was as unprecedented as his relation to the Government, and in like manner foreshadowed the Napoleonic period. It was not that of a civilized belligerent, but of a universal conqueror. The Revolution had put all international law into abeyance. Bonaparte in Italy, as in his later wars, knew nothing of neutrality. Thus Tuscany, the first of all states to conclude a treaty with the French republic, was not thereby saved from invasion. Bonaparte's troops marched in, seized Leghorn, and took possession of all the English property found in that port. More remarkable still was the treatment of Venice. The territory of the republic was turned unceremoniously into a field of battle between France and Austria, and at the end of the war the Venetian republic was blotted out of the map.

The summer of 1797 was passed by Bonaparte at Montebello near Milan. Here he rehearsed in Italy the part of emperor, formed his court, and accustomed himself to all the functions of government. He was chiefly engaged at this time in accomplishing the dissolution of the Venetian republic. He had begun early in the spring by provoking insurrections in Brescia and Bergamo. In April the insolence of a French officer provoked a rising against the French in Salò, for which Junot, sent by Bonaparte, demanded satisfaction of the senate on the 15th. The French now attempted to disarm all the Venetian garrisons that remained on the *terra firma*, and this led to a rising at Verona in which some hundreds of Frenchmen were massacred (April 17th). On the 19th a French sea-captain, violating the customs of the port at the Lido, was fired upon from a Venetian fort. Bonaparte declared that he would now be a new Attila to Venice, and issued a declaration of war. The feeble Government could only submit. A revolution took place at Venice, and French troops took possession of the town on May 16th. A treaty was now concluded by Bonaparte "establishing peace and friendship between the French republic and the republic of Venice," and providing that "the French occupation should cease as soon as the new Government should declare that it no longer needed foreign assistance." "A principal object of this treaty," as Bonaparte candidly explained to the Directory, "was to obtain possession without hindrance of the city, the arsenal, and everything." At the time that he was thus establishing friendship he was, as we know, ceding the territory of Venice, including at last the town, to Austria.

Austria had still one hope, for it seemed impossible that France herself could suffer Bonaparte to run his headlong career without interference, especially as she now had popular assemblies. The difficulty which Bonaparte had dissipated by his cannon in Vendémiaire had returned, as it could not fail to do. A Jacobinical regicide republic had to support itself in the midst of a nation which was by no means Jacobinical, and which had representative assemblies. These assemblies, renewed by a third, for the second time in the spring of 1797, placed Pichegru, suspected of royalism, in the chair of the Five Hundred, and Europe began to ask whether the restoration of the Bourbons was about to follow. Bonaparte at Montebello found that the Austrian negotiators were bent upon delay.

The rising party was not, perhaps, mainly royalist; its most conspicuous representative, Carnot, the Director, was himself a regicide. In the main it aimed only at

respectable government and peace, but a minority were open to some suspicion of royalism. This suspicion was fatal to the whole party, since royalism had by this time been thoroughly discredited by the follies of the *émigrés*.

The catastrophe came on 18th Fructidor (September 4, 1797), when Augereau, one of Bonaparte's generals of division, who had been sent by Bonaparte to Paris, surrounded the Corps Législatif with 12,000 men and arrested the most obnoxious representatives, while another force marched to the Luxembourg, arrested the Director Barthélemy, and would have arrested Carnot had he not received warning in time to make his escape. This stroke was followed by an outrageous proscription of the new party, of whom a large number, consisting partly of members of the Councils, partly of journalists, were transported to die at Cayenne, and the elections were annulled in forty-eight departments.

Such was Fructidor, which may be considered as the third of the revolutions which compose the complex event usually known as the French Revolution. In 1789 the absolute monarchy had given place to a constitutional monarchy, which was definitely established in 1791. In 1792 the constitutional monarchy fell, giving place to a republic which was definitely established in 1795. Since 1795 it had been understood that revolution was over, and that France was living under a constitution. But in Fructidor this constitution also fell, and government became revolutionary again. It was evident that a third constitution must be established; it was evident also that this constitution must set up a military form of government—that is, an imperialism; but two more years passed before this was done.

The benefit of the change was reaped in the end by Bonaparte. Naturally he favored it and took a great share in contriving it. But it seems an exaggeration to represent him as the exclusive or even the principal author of Fructidor. Hoche took the same side as Bonaparte.

The death of Hoche, occurring soon after, removed from Bonaparte's path his only rival in the affections of the already omnipotent soldiery. Hoche alone among the generals beside Bonaparte had shown political talents; had he lived longer, he might have played with success the part in which Moreau afterward failed.

The revolution of Fructidor, being military, had an immediate effect on foreign affairs. It commenced the period which was to last till the fall of Napoleon, a period of war pursued by France for its own sake, and as a kind of national business. As negotiations with England were at once violently broken off, so a change came over the negotiations with Austria. With the fall of the peace party Austria lost all hope of favorable terms. Between the beginning of September and the middle of October this struggle continued; at length, on October 17th, the treaty was signed at the little village of Campo Formio (more correctly Campo Formido), close to Udine. Bonaparte took his own course, gave Venice, Istria, Dalmatia, and all Venetian territory beyond the Adige to Austria, founded the Cisalpine Republic, and reserved for France, besides Belgium, Corfu and the Ionian Islands. A congress was to open at Rastatt, and Austria bound herself by a secret article to do her best to procure for France from the Germanic body the left bank of the Rhine. By retaining the Ionian Islands Bonaparte gave the first intimation of his design of opening the Eastern question.

He now left Italy, setting out from Milan on November 17th, made a flying visit to Rastatt, where the congress had already assembled, and reached Paris on December 5th. What next would be attempted by the man who at twenty-seven had conquered Italy and

brought to an end the most memorable Continental war of modern times? From a speech delivered by him on the occasion of his reception by the Directory it appears that he had two thoughts in his mind—to make a revolution in France and to emancipate Greece. He had now some months in which to arrange the execution of these plans. The Directory, seeing no safety but in giving him employment, now committed the war with England to his charge. He becomes "général en-chef de l'armée d'Angleterre." During the last war between Russia and Turkey some publicists (including Volney, an acquaintance of Bonaparte's) had recommended France to abandon her ancient alliance with Turkey and seek rather to share with Russia in her spoils. Thus was suggested to Bonaparte in Italy the thought of seizing Greece. Now as head of the army of England he fixed his eyes on Egypt also. In India the game was not quite lost for France, but England had now seized the Cape of Good Hope. To save, therefore, what remained of her establishments in India, France must seize Egypt. She must not only conquer but colonize it. Such was the scheme, according to which Turkey was to be partitioned in the course of a war with England, as Venice had disappeared in the course of a war with Austria.

That such a scheme could scarcely fail to kindle a new European war more universal than that which Bonaparte had just brought to a close was probably its principal recommendation in his eyes. He also instinctively saw that, while he conquered in the East, France, deprived of her best troops and generals, would suffer disasters at home, though he could not anticipate what actually happened—that she would be unfortunate both at home and in the East. But the European war showed signs of recommencing even before he could set sail. In the spring of 1798 the old constitution of Switzerland was overthrown, French troops entered Bern and seized a treasure of 40,000,000 francs; at the same time a quarrel was picked with the Papal Government; it was overthrown, the treasury plundered, and the aged pope, Pius VI., carried into captivity. Thus, as Berthier said, money was furnished for the Egyptian campaign; but on the other hand Europe was thoroughly roused.

The departure of Bonaparte for the East with 30,000 men and Generals Murat, Berthier, Desaix, Kléber, Lannes, Marmont—Nelson in front of him and a European war behind—perhaps marks the moment of wildest confusion in the modern history of Europe. He set sail on May 19th, having stimulated the zeal of his soldiers by promising that each should return rich enough to buy six "arpents" of land (the Directory were obliged to deny the genuineness of the proclamation), and, eluding Nelson, who had been driven by a storm to the Island of St. Pietro near Sardinia, arrived, on June 9th, at Malta, where a squadron from Civita Vecchia and another from Ajaccio had preceded him. This island was in the possession of the Knights of St. John of Jerusalem, who acknowledged the king of Naples as their feudal superior and the czar as their protector. To attack them was to involve France in war with both Naples and Russia. Bonaparte, demanding admission into the harbor for his fleet, and receiving answer that the treaties which guaranteed the neutrality of Malta permitted only the admission of four ships, attacked at once, as indeed he had been expressly commanded by the Directory to do. The people rose against the knights; the grand master Hompesch opened negotiations, and on the 12th Bonaparte entered La Valette. He was enthusiastic about the strength and importance of the position thus won. He spent some days in organizing a new government for the island, and set sail again on the 19th. On July 2d he issued his first order in Alexandria.

During the passage we find him prosecuting his earlier scheme of the emancipation of Greece. Thus from Malta he sent Lavalette with a letter to Ali Pasha of Janina. His plan therefore seemed to embrace Greece and Egypt at once, and thus to take for granted the command of the sea, almost as if no English fleet existed. The miscalculation was soon made manifest. Bonaparte himself, after occupying Alexandria, set out again on the 8th and marched on Cairo; he defeated the Mamelukes first at Chebreiss and then at Embabeh, within sight of the Pyramids, where the enemy lost 2,000 and the French about 20 or 30 killed and 120 wounded. He was in Cairo on the 24th, where for the most part he remained till January of 1799. But a week after his arrival in Cairo, the fleet which had brought him from France, with its admiral Brueys, was destroyed by Nelson in Aboukir Bay. For the first time, in reporting this event to the Directory, it seemed to flash on Bonaparte's mind that the English were masters of the sea. The grand design was ruined by this single stroke. France was left at war with almost all Europe, and with Turkey also (for Bonaparte's hope of deceiving the sultan by representing himself as asserting his cause against the Mamelukes was frustrated), and her best generals, with a fine army, were imprisoned in another continent.

It might still be possible to create a revolution in Turkey in Asia, if not in Turkey in Europe. The Turks were preparing an army in Syria, and in February, 1799, Bonaparte anticipated their attack by invading Syria with about 12,000 men. He took El Arish on the 20th, then Gaza, and arrived at Jaffa on March 3d. It was taken by assault, and a massacre commenced which, unfortunately for Bonaparte's reputation, was stopped by some officers. The consequence was that upward of 2,000 prisoners were taken. Bonaparte, unwilling either to spare food for them or to let them go, ordered the adjutant-general to take them to the seashore and there shoot them, taking precautions to prevent any from escaping. This was done. "Now," writes Bonaparte, "there remains St. Jean D'Acre." This fortress was the seat of the pasha, Jezzar. It was on the seashore, and accordingly England could intervene. Admiral Sir Sidney Smith, commanding a squadron on the coast, opened fire on the French as they approached the shore, and was surprised to find his fire answered only by musketry. In a moment he divined that the siege artillery was to come from Alexandria by sea, and very speedily he discovered the ships that carried it and took possession of them. On March 19th Bonaparte was before Acre, but the place received supplies from the sea, and support from the English ships, while his artillery was lost. He was detained there for two whole months, and retired at last without success. This check, he said, changed the destiny of the world, for he calculated that the fall of Jezzar would have been followed by the adhesion of all the subject tribes, Druses and Christians, which would have given him an army ready for the conquest of Asia.

The failure had been partially redeemed by a victory won in April over an army which had marched from the interior to the relief of Acre under Abdallah Pasha, and which Bonaparte defeated on the plain of Esdraelon (the battle is usually named from Mount Tabor). In the middle of May the retreat began, a counterpart on a small scale of the retreat from Moscow, heat and pestilence taking the place of frost and Cossacks. On the 24th he was again at Jaffa, from which he wrote his report to the Directory explaining that he had deliberately abstained from entering Acre because of the plague which, as he heard, was ravaging the city. On June 14th his letters were again dated from Cairo. His second stay in Egypt lasted two months, which were spent partly in

hunting the dethroned chief of the Mamelukes, Murad Bey, partly in meeting a new Turkish army, which arrived in July in the Bay of Aboukir. He inflicted on it an annihilating defeat near its landing-place; according to his own account ten or twelve thousand persons were drowned. This victory marked the final failure of the expedition.

It appears from his correspondence that he had promised to be back in France as early as October, 1798, a fact which shows how completely all his calculations had been disappointed. Sir Sidney Smith now contrived that he should receive a packet of journals, by which he was informed of all that had passed recently in Europe and of the disasters that France had suffered. His resolution was immediately taken. On August 22d he wrote to Kléber announcing that he transferred to him the command of the expedition, and that he himself would return to Europe, taking with him Berthier, Lannes, Murat, Andréossi, Marmont, Monge, and Berthollet, and giving orders that Junot should follow in October and Desaix in November. After carefully spreading false accounts of his intentions, he set sail with two frigates in the night of the same day. He arrived after a voyage of more than six weeks (during which he revisited Corsica) in the harbor of Fréjus, on October 9th.

From this moment the tide of his fortune began to flow again. His reappearance seemed providential, and was hailed with delight throughout France. The system established in Fructidor was essentially military. In Italy the conquest had been pushed too far. Half the troops were locked up in fortresses or occupied in suppressing rebellions; hence Macdonald at the Trebbia and Joubert at Novi were defeated by Suwaroff, Mantua fell, and the work of Bonaparte in Italy was well-nigh undone. Government was shaken by these disasters. A kind of revolution took place in June. Four new members entered the Directory, of whom three—Gohier, Roger-Ducos, and General Moulin—represented on the whole the revival of the Jacobinism of 1793, while the fourth, Sieyès, the most important politician of this crisis, represented the desire for some new constitutional experiment. The remedy which first suggested itself was to return to the warlike fury and terrorism of 1793. The Jacobin Club revived and held its sittings in the Salle du Manège. Many leading generals, especially Jourdan and Bernadotte, favored it. But 1793 was not to be revived. Its passions had gone to sleep, and the memory of it was a nightmare. Nevertheless a sort of Terror began. The hardship of recruitment caused rebellions, particularly in the west. Chouannerie and Royalism revived, and the odious Law of Hostages was passed to meet them. After seven years of misery France, in the autumn of 1799, was perhaps more miserable than ever.

Upon this perplexing gloom the reappearance of Bonaparte came like a tropical sunrise, too dazzling for Sieyès himself, who wanted a general, but a general he could control. On October 16th he arrived at his old Parisian house in the Rue de la Victoire, and on November 9th and 10th (Brumaire 18, 19) the revolution took place. The movement which now took place was the most respectable, the most hopeful, as for a long time it seemed the most successful, effort that had been made since 1792 to lift France out of the slough. Instead of reviving Jacobinism it was resolved to organize a strong and skilled Government. A grand party of respectability rallied round Sieyès to put down Jacobinism. Ducos among the Directors (he had been converted), the majority of the Council of Ancients, Moreau and Macdonald, the generals of purest reputation, Bonaparte and the generals personally attached

to him, composed this party. On the other side the Jacobinical party consisted of the Directors Gohier and Moulin, the majority of the Council of Five Hundred, Generals Jourdan and Bernadotte. Which party would be followed by the rank and file of the army was an anxious question.

It was determined to take advantage of a provision of the constitution which had been originally inserted by the Girondists as a safeguard against aggressions from the municipality of Paris, and to cause the Council of Ancients to decree a meeting of the Councils outside Paris at the palace of St. Cloud. At this meeting it was intended to propose a reform of the constitution. The proposal would be supported by a majority in the Council of Ancients, and by many, but probably not a majority, in the Council of Five Hundred. It was foreseen that the Jacobins might give trouble, and might need to be eliminated, as they had themselves eliminated the Girondins. With a view to this, when the decree was passed on November 9th, General Bonaparte, made commander of all the troops in Paris, was intrusted with the execution of it. It is carefully to be observed that he does not, like Cromwell, act of his own free will against the assembly, but is appointed by the assembly to act in its name. No one thought of destroying the republic; the question was of introducing the famous perfect constitution of Sieyès. Bonaparte appeared, surrounded by the generals of his party, in the Council of Ancients, where he skillfully evaded taking the oath to the constitution. He then reviewed the troops, and it became apparent that he could count on them. From this moment Brumaire may be said to have been decided. The next step was that Sieyès and Ducos resigned their places on the Directory; Barras was induced to follow their example; but Gohier and Moulin were firm. Gohier was placed under ward of Moreau at the Luxembourg, while Moulin made his escape. It now only remained to deal with the Council of Five Hundred, the stronghold of Jacobinism.

The revolution was consummated on the next day at St. Cloud. Bonaparte and Sieyès sat in a private room while the Councils began their deliberations; but, being informed that it was proposed to renew the oath to the existing constitution, Bonaparte determined to interfere. Bonaparte then entered the Council of Ancients, where he delivered a confused harangue which did him little good, though the assembly was well-disposed to him. His position was a false one, though he urged very justly that the existing constitution had been practically destroyed by the illegalities of Fructidor, Floréal, and Prairial. He then passed to the hostile Council of Five Hundred, where he was received with cries of *Hors la loi! A bas le dictateur!* He was seized by the collar and attempts were made to push him out of the hall.

He was now almost in despair, and no wonder! By the backwardness of Sieyès he had been pushed into the part of Cromwell. But Cromwell had soldiers devoted to him, and of theocratic rather than republican ideas; the soldiers of Bonaparte had only just been put under his command, and they were fanatical republicans. The false step must be retrieved. The soldiers must be persuaded that Bonaparte was no Cromwell, but a stanch republican, and that they were not called upon to act against an assembly, but only against a traitorous minority, as at Fructidor. Lucien Bonaparte, who was president of the Five Hundred, performed this miracle. Bonaparte had sent grenadiers to rescue him. Lucien was at the tribune, where he was defending his brother amid noisy interruption. At the appearance of the grenadiers he threw off his official dress and retired under their escort. In the hall he mounted on horse-

back and addressed the troops who were employed to guard the legislature, declaring that the council was oppressed by assassins, brigands paid by England; he charged the soldiers to deliver the majority from this oppression by clearing the hall. He brandished a sword and swore to stab his brother if ever he attacked the liberties of Frenchmen. On the clear understanding that no violence against the assembly was intended, and with the express sanction of its president, the soldiers then cleared the hall. In the evening at nine o'clock Lucien reassembled a certain number of the members and proposed to them to nominate a committee which should report on the state of affairs. This committee was at once named, and speedily presented a report to the effect that Sieyès, Roger-Ducos, and Bonaparte should compose a provisional executive under the title of consuls, that the legislature should adjourn till February 20th (1 Ventose), a committee of twenty-five members from each Council being left to deliberate along with the consuls upon the changes to be made in the constitution; at the same time, as in Fructidor, a certain number of members (fifty-five) were to be expelled from the Councils.

Brumaire taken by itself is the victory of Sieyès rather than of Bonaparte. It raised Sieyès to the position he had so long coveted of legislator for France. The constitution now introduced was really in great part his work, but his work so signally altered in one point that it resulted in the absolute supremacy of Bonaparte.

But, while he absolutely condemned democracy, Sieyès did not want to set up despotism. The Senate was to be supreme; it was to be a kind of hereditary aristocracy, the depositary of the tradition of the Revolution; above it, and capable of being deposed by it, was to be a doge called Grand Elector, whose main function consisted in choosing two consuls, of whom one was to take the home and the other the foreign department. Here again Bonaparte acquiesced as far as he could. He adopted the consuls and the triple executive, even lowering apparently the grand elector of Sieyès by giving him the more republican title of First Consul.

The provisional consulate of Sieyès, Ducos, and Bonaparte lasted only from November 10th to December 13th. Then through the promulgation of the new constitution it made way for the definitive consulate of Bonaparte, Cambacérès, and Lebrun, which lasted four years. By the constitution of 22 Frimaire, year VIII. (which was never debated in any assembly, but, after being devised by the two legislative committees meeting at the Luxembourg under the presidency of Bonaparte, and in the presence of other consuls, and after being redacted by Daunou, was introduced by a popular vote), Bonaparte became First Consul for ten years, with a salary of 500,000 francs, with a sole power of nominating the council of state, the ministers, ambassadors, officers of army and fleet, and most of the judges and local officials, and with a power in nominal conjunction with the other consuls of initiating all legislation and deciding war and peace. Sieyès and Ducos retired, and under the new constitution the second and third consuls were Cambacérès, an eminent legist, and Lebrun, an old official of Louis XV.'s time. The party of Brumaire had intended to set up a republic, but this constitution created a strong monarchy under the thinnest disguise.

To Moreau the success of Brumaire had been mainly due, and he had perhaps thought that the new constitution, and it did not seem to contemplate the First Consul commanding an army, had removed Bonaparte from the path of his ambition. He now held the command of the principal army, that of the Rhine, in which post Bonaparte could not venture to supersede him. The

problem for Bonaparte throughout the war was to prevent Moreau, and in a less degree Masséna, who was now in command of the army of Italy, from eclipsing his own military reputation. Russia had now retired from the Coalition, so that, as in 1796, Austria and England were the only belligerents. Italy had been almost entirely lost, and Masséna, at the head of the army of Italy, opposed to General Melas, was almost where Bonaparte had been before his Italian campaign began. But France had retained the control of Switzerland, and Moreau with more than 100,000 men arranged along the Rhine from the Lake of Constance to Alsace stood opposed to Kray, whose headquarters were at Donauechingen. It seemed that the campaign would be conducted by Moreau and Masséna receiving instructions from Bonaparte at Paris.

The campaign of Marengo was astonishingly short. On May 11th Bonaparte left Geneva, and he was in Paris again before the end of June. In Italy the affairs of France looked darker than ever, when Bonaparte threw himself on the rear of Melas by passing the Great St. Bernard between May 15th and 20th. Other divisions passed the Little St. Bernard and the Mont Cenis, while the detachment from Moreau's army (under Moncey, not Lecourbe) descended the St. Gotthard. It seems that the Austrians had absolutely refused to believe, what was openly discussed in the Paris journals, that Bonaparte intended to cross the Alps. Bonaparte had another surprise in store for them. Though Genoa was suffering all the horrors of famine, he made no attempt to relieve it, but turned to the left, entered Milan, and took possession of the whole line of the Ticino and the Po. Meanwhile Genoa capitulated to General Ott. Melas was now at Alessandria, where Bonaparte sought him on the 13th. On the 14th Melas marched out, crossed the Bormida, and arrived at Marengo. The victory here won by Bonaparte, though in its consequences more decisive than any other, and marking in a certain sense the culmination of his career, yet was due almost entirely to accident. A sudden charge of cavalry by Kellermann changed a great Austrian victory into a decisive Austrian defeat. On the next day Melas (having, as it seems, quite lost his head) signed a convention by which Austria sacrificed almost all North Italy, restoring something like the position of Campo Formio. Bonaparte returned to Paris, victorious at once over Austria and over Moreau and Masséna. He did not, however, succeed in tearing from Moreau the honor of concluding the war. Marengo did not lead to peace; this was won, where naturally it could only be won, in Bavaria by Moreau's victory of Hohenlinden (December 3d), a victory perhaps greater than any of which at that time Bonaparte could boast.

Never was Bonaparte more recklessly audacious, never was he more completely and undeservedly successful, than in this campaign.

His appeal for peace after Brumaire had not been purely insincere, though he wanted victory before peace. He proposed to Rouget de Lisle to write "a battle hymn which shall express the idea that with great nations peace comes after victory." After Marengo he devoted himself to giving peace to the world; he did this by three great acts, so that in 1802 for the first time for ten years under the new Augustus "no war or battle sound was heard the world around." These three acts are the treaty of Lunéville, February, 1801, the Concordat, July, 1801, the treaty of Amiens, March, 1802.

After the treaty of Lunéville, as after that of Campo Formio, England was left to fight France alone; but Bonaparte had now a higher estimate than in 1798 of England's naval power. He was able, however, in

1801 to attack her in another way. By her conduct at Malta she had given offense to the czar Paul, and taking advantage of this Bonaparte was able to revive against her the armed neutrality of 1780. Not only Russia but Prussia was thus brought for the first time, along with Sweden and Denmark, into the French alliance, and the system of Tilsit was for the first time sketched out. But it lasted only for a moment. At the beginning of April the announcement of the murder of Paul and the bombardment of Copenhagen by Nelson dissolved it. England and France were now alike disposed for peace, the former because she had lost the support of a European Coalition, the latter because she had lost all means of attack, and also because of Bonaparte's grand plan of pacification. In the summer Bonaparte's endeavors were confined to saving the French colony in Egypt from the English, and to snatching a little territory from England's ally Portugal by means of Spain. But Cairo capitulated to the English in June, in which month also Spain made peace with Portugal. Accordingly in October the preliminaries of London were signed, and the treaty of Amiens followed in March. The allies of France paid for her naval defeats, Spain losing Trinidad and Holland Ceylon; but France, though she lost nothing, acquiesced by this treaty in the total failure of all her designs upon the East.

The globe was now at peace, and thanked Bonaparte for it. The equilibrium which had been destroyed by the Revolution seemed at length to be restored. Meanwhile the legislative reconstruction of France proceeded rapidly. This is the glorious period of Bonaparte's life, not, as has often been alleged, because he was as yet uncorrupted by power, but simply because a strong, intelligent government was the great need of France and repose the great need of Europe, and Bonaparte at this time satisfied both needs. The work of reconstruction which distinguishes the consulate, though it was continued under the empire, is the most enduring of all the achievements of Napoleon. The institutions of Modern France date, not, as is often said, from the Revolution, but from the consulate. Not that Napoleon personally was endowed with a supreme legislative genius; his principal merit was to have given to France the first secure government, the first government capable of effective legislation, that she had had since the destruction of her ancient institutions. The task of reconstruction fell to him of necessity; his personal interference was in many respects, as we shall see, mischievous rather than beneficial; it is, however, also true that he appreciated the greatness of the work, urged it on with vigor, entered into it, impressed it with the stamp of his own personality, and left upon it the traces of his keen sagacity.

The institutions now created, and which form the organization of modern France, are—(1) the restored Church, resting on the Concordat; (2) the University, resting on the law of 11 Floréal, An X. (May 1, 1802); (3) the judicial system, commenced by the law of 27 Ventose, An VIII. (March 18, 1800), and completed by other laws in 1810; (4) the Codes:—(a) Code Civil (commission nominated 24 Thermidor, An VIII., August 12, 1800; it received the name Code Napoléon on September 3, 1807), (b) Code de Commerce, promulgated on September 10, 1807; (c) Code Pénal, (d) Code d'Instruction Criminelle (came into force January 1, 1811); (5) the system of local government, resting on the law of 18 Pluviose, An VIII. (February 7, 1800); (6) the Bank of France, established 28 Nivose, An VIII. (January 18, 1800); (7) the Legion of Honor, established 29 Floréal An X. (May 19, 1802). These institutions, along with the military system, have in the main continued to the

present day after the downfall of all the Napoleonic institutions which were purely political.

From the time of the battle of Marengo the system of Brumaire began to take a development which perhaps had not been clearly foreseen. Sieyès had wished to confine Bonaparte to the war department, Moreau perhaps had wished to keep him at Paris; in either case it had not been intended to create an august monarchy. But the fabulous success of Marengo, joined to the proofs Bonaparte gave of a really superior intelligence and commanding character, turned the French mind back into that monarchical groove in which it had so long run before the Revolution.

In grappling with the defeated parties Bonaparte found a great advantage in his position. The constitution of Brumaire itself gave him great powers; popular institutions had been destroyed, not by him, but by the nation itself, which was weary of them; under the Directory the public had grown accustomed to the suppression of journals and to periodic *coups d'état* of the most savage violence. Bonaparte therefore could establish a rigorous despotism under the forms of a consular republic, mutilate the assemblies, and silence public opinion; he could venture occasionally upon acts of the most sweeping tyranny without shocking a people which had so lately seen Fructidor, not to say the Reign of Terror, and had been accustomed to call them liberty. The conspiracies began immediately after the return from Marengo, when the Corsicans Arena and Ceracchi, guilty apparently of little more than wild talk, were arrested in October, 1800, at the Théâtre Français. But on December 24th of the same year, as he drove with Josephine to the opera, a sudden explosion took place in the Rue Saint-Nicaise, which killed and wounded several people and damaged about fifty houses; the carriage of Bonaparte escaped. He arrested and transported 130 persons, whom he knew to be innocent of the plot, on the general ground of Jacobinism, substituting for all legal trial a resolution passed by the servile senate to the effect that "the measure was conservative of the constitution."

The first open step toward monarchy was made at the conclusion of the treaty of Amiens. As pacificator of the globe, it was declared in the tribunate that Bonaparte deserved some mark of public gratitude. Upon this the Senate proposed to reelect him First Consul for a further term of ten years. Bonaparte, disappointed, declared that he could only owe a prolongation of his magistracy to the people; to them therefore the question was referred, but in the form, Shall Napoleon Bonaparte be elected consul for life? and in this form it was adopted. Before the final step was taken and the First Consul transformed himself into the Emperor Napoleon, a great and portentous change had taken place in the spirit of his government. Before the year 1803, there was no fair reason to conclude that Bonaparte was too fond of war. For the two wars of the Revolution he had not been responsible; the first broke out when he was in Corsica, the second when he was in Egypt. But both wars had been brought to an end by him. In constructive legislation he had shown such zeal that it was easy to imagine him, though a great commander, as one who was capable of feeling the blessedness of the peacemaker. These illusions began to vanish in 1803, at the rupture of the peace of Amiens. This year, 1803, is the turning-point in his life, and a great turning-point in French history. It may be considered the first year of modern France.

This same year 1803 saw the first steps taken toward the subjugation of Germany. The annexation to France of the left bank of the Rhine led to a revolution in the Germanic system and to a complete transforma-

tion of the Diet, by which Austria lost the greater part of her influence over the minor German states; this influence passed to France. As soon as the rupture with England took place Bonaparte took up a position in the heart of Germany by seizing Hanover.

All this was done while Bonaparte was still nominally only consul in the French republic. But the rupture with England furnished him with the occasion of throwing off the last disguise and openly restoring monarchy. It was a step which required all his audacity and cunning. He had crushed Jacobinism, but two great parties remained. There was first the more moderate republicanism, which might be called Girondism, and was widely spread among all classes and particularly in the army. Secondly, there was the old royalism, which after many years of helpless weakness had revived since Brumaire. These two parties, though hostile to each other, were forced into a sort of alliance by the new attitude of Bonaparte, who was hurrying France at once into a new revolution at home and into an abyss of war abroad. Royalism from England began to open communications with moderate republicanism in France. Pichegru acted for the former, and the great representative of the latter was Moreau, who had helped to make Brumaire in the tacit expectation probably of rising to the consulate in due course when Bonaparte's term should have expired, and was therefore hurt in his personal claims as well as in his republican principles. Bonaparte watched the movement through his ubiquitous police, and with characteristic strategy determined not merely to defeat it, but to make it his stepping-stone to monarchy. He would ruin Moreau by fastening on him the stigma of royalism; he would persuade France to make him emperor in order to keep out the Bourbons. Moreau had in 1797 incurred blame by concealing his knowledge of Pichegru's dealings with the royalists. That he should now meet and hold conversation with Pichegru at a moment when Pichegru was engaged in contriving a royalist rebellion associated his name still more closely with royalism, and Pichegru brought with him wilder partisans such as Georges the Chouan. Bonaparte succeeded in associating Moreau with royalist schemes and with schemes of assassination. Controlling the Senate, he was able to suppress the jury; controlling every avenue of publicity, he was able to suppress opinion; and the army, Moreau's fortress, was won through its hatred of royalism. In this way Bonaparte's last personal rival was removed. There remained the royalists, and Bonaparte hoped to seize their leader, the Comte d'Artois, who was expected, as the police knew, soon to join Pichegru and Georges at Paris. What Bonaparte would have done with him we may judge from the course he took when the Comte did not come. On March 15, 1804, the Duc d'Enghien, grandson of the Prince de Condé, residing at Ettenheim in Baden, was seized at midnight by a party of dragoons, brought to Paris, where he arrived on the 20th, confined in the castle of Vincennes, brought before a military commission at two o'clock the next morning, asked whether he had not borne arms against the republic, which he acknowledged himself to have done, conducted to a staircase above the moat and there shot, and buried in the moat.

This deed was perfectly consistent with Bonaparte's professed principles, so that no misunderstanding or passing fit of passion is required to explain it. He had made, shortly before, a formal offer to the pretender through the king of Prussia, by which he had undertaken to pay him a handsome pension in return for the formal abdication of his rights. This had been refused, and Bonaparte felt free. That the best course was to strike at the heads of the family was a shrewd con-

clusion. Neither Louis nor Charles was precisely a hero; and then the whole revolutionary party in France would applaud a new tragedy like that of January, 1793. That the Duc d'Enghien was innocent of the conspiracy was nothing to the purpose; the act was political, not judicial; accordingly he was not even charged with complicity. That the execution would strike horror into the cabinets, and perhaps bring about a new Coalition, belonged to a class of considerations which at this time Bonaparte systematically disregarded.

This affair led immediately to the thought of giving heredity to Bonaparte's power. The thought seems to have commended itself irresistibly even to strong republicans and to those who were most shocked by the murder. To make Bonaparte's position more secure seemed the only way of averting a new Reign of Terror or new convulsions. Like Cromwell, he was afraid of the republicanism of the army, and heredity pure and simple brought him face to face with the question of divorcing Josephine. To propitiate the army he chose from the titles suggested to him—consul, stadtholder, etc.—that of emperor, undoubtedly the most accurate, and having a sufficiently military sound. The other difficulty, after much furious dissension among the two families of Bonaparte and Beauharnais, was evaded by giving Napoleon himself (but none of his successors) a power of adoption, and fixing the succession, in default of a direct heir natural or adoptive, first in Joseph and his descendants, then in Louis and his descendants. Except abstaining from the regal title, no attempt was made to conceal the abolition of republicanism. Bonaparte was to be called Napoleon, and "sire" and "majesté;" grand dignitaries with grand titles were appointed; and "citoyen" from this time gave way to "monsieur." The change was made by the constituent power of the Senate, and the *senatus-consultus* is dated May 18, 1804. It required some impudence to condemn Moreau for royalism at the very moment that his rival was reëstablishing monarchy. Yet his trial began on May 15th. The death of Pichegru, nominally by suicide, on April 6th had already furnished the rising sultanism with its first dark mystery. Moreau was condemned to two years' imprisonment, but was allowed to retire to the United States.

Throughout 1804 and the first part of 1805 the policy of Bonaparte was such as might be called insane, if he had had the ordinary objects of a ruler; it is explained by the consideration that he wanted war, even if it should be war with all the world. He had acted in a similar way in 1798. In thinking that he should profit by war he was not mistaken. Had he only gone to war with the whole continent at once, he would not, as the event proved, have overestimated his strength. But he was not, in the long run, a match for England and the Continent together; he made at starting the irremediable mistake of not dividing these two enemies. He seems, indeed, to have set out with a monstrous miscalculation which might have ruined him very speedily, for he had laid his plans for an invasion of England and a war in Europe at the same time.

The new empire compared itself to that of Charlemagne, which extended over Italy and Germany, and on December 2, 1804, a parody of the famous transference of the empire took place in Notre Dame, the pope (Pius VII.) appearing there to crown Napoleon, who, however, took the crown from his hands and placed it himself upon his own head. Meanwhile the Italian republic was changed into a kingdom, which at first Bonaparte intended to give to his brother Joseph, but in the end accepted for himself. In the first months of 1805, fresh from the *sacre* in Notre Dame, he visited Italy and received the iron crown of the Lombard kings

at Milan. Soon after the Ligurian republic was annexed, and a principality was found for his brother-in-law Bacciochi in Lucca and Piombino.

Had public opinion been less enslaved in France, had the frivolity of the nation been less skillfully amused by the operatic exhibitions of the new court and the *sacre* in Notre Dame, it would have been remarked that, after most needlessly involving France in war with England, Bonaparte had suffered half the year 1803, all the year 1804, and again more than half the year 1805 to pass without striking a single blow, that after the most gigantic and costly preparations the scheme of invasion was given up, and that finally France suffered a crushing defeat at Trafalgar which paralyzed her on the side of England for the rest of the war. In order to understand in any degree the course he took, it seems necessary to suppose that the intoxication of the Marengo campaign still held him, that as then, contrary to all expectation, he had passed the Alps, crushed his enemy, and instantly returned, so now he made no doubt of passing the Channel, signing peace in London, and returning in a month with a fabulous indemnity in his pocket to meet the coalition in Germany. To conquer England it was worth while to wait two years, but his position was very critical when, after losing two years, he was obliged to confess himself foiled. He retrieved his position suddenly, and achieved a triumph which, though less complete than that which he had counted on, was still prodigious—the greatest triumph of his life.

It was at the end of August, 1805, that Napoleon made his sudden change of front. At the beginning of that month he had been still intent on the invasion of England; ever since March maritime manœuvres on an unparalleled scale had been carried on with the object of decoying the English fleets away from the Channel, and so giving an opportunity for the army of invasion to cross it in a flotilla under the protection of French fleets. But in spite of all manœuvres a great English fleet remained stationary at Brest, and Nelson, having been decoyed to Barbados, returned again. In the last days of August, Admiral Villeneuve, issuing from Ferrol, took alarm at the news of the approach of an English fleet, and instead of sailing northward, faced about and retired to Cadiz. Then for the first time Napoleon admitted the idea of failure, and saw the necessity of screening it by some great achievement in another quarter. He resolved to throw his whole force upon the Coalition, and to do it suddenly. Prussia was to be bribed by the very substantial present of Hanover.

Five years had passed since Napoleon had taken the field when the second period of his military career began. He now began to make war as a sovereign with a boundless command of means. For five years, from 1805 to 1809 he took the field regularly, and in these campaigns he founded the great Napoleonic empire. By the first he broke up the Germanic system and attached the minor German states to France, by the second he humbled Prussia, by the third he forced Russia into an alliance, by the fourth he reduced Spain to submission, by the fifth he humbled Austria. Then followed a second pause, during which for three years Napoleon's sword was in the sheath, and he was once more ruler, not soldier.

Napoleon's strategy always aimed at an overwhelming surprise. As in 1800, when all eyes were intent on Genoa, and from Genoa the Austrians hoped to penetrate into France, he created an overwhelming confusion by throwing himself across the Alps and marching not upon Genoa but upon Milan, so now he appeared not in front of the Austrians but behind them and between them and Vienna. Mack, who at Naples in 1790

had moved the impatient contempt of Nelson, now stood matched against Napoleon at the height of his power. He occupied the line of the Iller from Ulm to Memmingen, expecting the attack of Napoleon, who personally lingered at Strasburg, in front. Meanwhile the French armies swarmed from Hanover and down the Rhine, treating the small German states half as allies, half as conquered dependents, and disregarding all neutrality, even that of Prussia, till they took up their positions along the Danube from Donauwörth to Ratisbon far in the rear of Mack. The surprise was so complete that Mack, who in the early days of October used the language of confident hope, on the 19th surrendered at Ulm with about 26,000 men, while another division, that of Werneck, surrendered on the 18th to Murat at Nördlingen. In a month the whole Austrian army consisting of 80,000 men, was entirely dissolved. Napoleon was master of Bavaria, recalled the elector to Munich, and received the congratulations of the electors of Würtemberg and Baden (they had just at this time the title of electors). It was the stroke of Marengo repeated, but without a doubtful battle and without undesired good luck.

After Marengo it had been left to Moreau to win the decisive victory and to conclude the war; this time there was no Moreau to divide the laurels. The second part of the campaign began at once; on October 28th Napoleon reported that a division of his army had crossed the Inn. He had now to deal with the Russians, of whom 40,000 men had arrived under Kutusoff. He reached Linz on November 4th, where Gyulai brought him the emperor's proposals for an armistice. He replied by demanding Venice and Tyrol and insisting upon the exclusion of Russia from the negotiations, conditions which, as he no doubt foresaw, Gyulai did not think himself authorized to accept. But Napoleon did not intend this time, as in 1797 and in 1800, to stop short of Vienna. Nothing now could resist his advance, for the other Austrian armies, that of the archduke John in Tyrol and that of the archduke Charles on the Adige, were held in play by Ney and Masséna, and compelled at last, instead of advancing to the rescue, to retire through Carniola into Hungary. On November 14th he dates from the palace of Schönbrunn; on the day before Murat had entered Vienna, which the Austrian emperor, from motives of humanity, had resolved not to defend, and the French also succeeded in getting possession of the bridges over the Danube. So far his progress had been triumphant, and yet his position was now extremely critical. The archduke Charles was approaching from Hungary with 80,000 Austrians; another Russian army was entering Moravia to join Kutusoff, who had with great skill escaped from the pursuit of Murat after the capture of Vienna. Napoleon, though he had brought 200,000 men into Germany had not now, since he was obliged to keep open his communications down the valley of the Danube, a large army available for the field. But, what was much more serious, he had recklessly driven Prussia into the opposite camp. He had marched troops across her territory of Ansbach, violating her neutrality, and in consequence on November 3d (while Napoleon was at Linz) she had signed with Russia the treaty of Potsdam, which practically placed 180,000 of the most highly drilled troops in the world at the service of the Coalition.

As at Marengo, fortune favored his desperate play. The allies had only to play a waiting game, but this the Russians and their young czar, who was now in the Moravian headquarters, would not consent to do. He was surrounded by young and rash counselors, and the Russians, remembering the victories of Suwaroff in 1799,

and remarking that almost all Napoleon's victories hitherto had been won over Austrians, had not yet learned to be afraid of him. Napoleon became aware of their sanguine confidence from Savary, whom he had sent to the czar with proposals; he contrived to heighten it by exhibiting his army as ill-prepared to Dolgorouki, sent to him on the part of the czar. The end was that the Russians (80,000 men, aided by about 15,000 Austrians) rushed into the battle of Austerlitz (December 2, 1805), which brought the third Coalition to an end, as that of Hohenlinden had brought the second. Nowhere was Napoleon's superiority more manifest; the Russians lost more than 20,000 men, the Austrians 6,000. The former retired at once under a military convention, and before the year 1805 was out the treaty at Pressburg was concluded with Austria (December 26th) and that of Schönbrunn with Prussia (December 15th).

It was a transformation scene more bewildering than even that of Marengo, and completely altered the position of Napoleon before Europe. In the summer of 1806 the emperor of Austria (he had this title since 1804) solemnly abdicated the title of Roman emperor; the ancient diet of Ratisbon was dissolved, and a new organization was created under the name of Confederation of the Rhine, in which the minor states of Germany were united under the protectorate of Napoleon. Bavaria and Würtemberg at the same time were raised into kingdoms. In all the changes which have happened since, the Holy Roman Empire has never been revived, and this event remains the greatest in the modern history of Germany.

The first half of 1806 was devoted to the internal reconstruction of Germany and to the negotiation of peace with the two great belligerents who remained after Austria and Prussia had retired, viz., England and Russia. But these negotiations failed, and in failing created suddenly a new Coalition. In England, Fox showed unexpectedly all the firmness of Pitt; and the czar refused his ratification to the treaty which his representative at Paris, D'Oubril, had signed. But the negotiations had gone far enough to give Prussia deep offense. At a moment when she found herself almost shut out of the German world by the new Confederation, Napoleon was found coolly treating with England for the restoration of Hanover to George III. In August, 1806, just at the moment of the dissolution of the Holy Roman Empire and the formation of the Confederation of the Rhine, Prussia suddenly mobilized her army, and about the same time Russia rejected the treaty. This amounted practically to a new Coalition, or to a revival of the old one with Prussia in the place of Austria. No one knew so well as Napoleon the advantage given by suddenness and rapidity. The year before he had succeeded in crushing the Austrians before the Russians could come up; against Prussia he had now the advantage that she had long been politically isolated, and could not immediately get help from either Russia or England—for the moment only Saxony and Hesse-Cassel stood by her—while his armies, to the number of 200,000 men, were already stationed in Bavaria and Swabia, whence in a few days they could arrive on the scene of action. The year before Austria had been ruined by the incapacity of Mack; Prussia now suffered from an incapacity diffused through the higher ranks both of the military and of the civil service. Generals too old, such as Brunswick and Möllendorf, a military system corrupted by long peace, a policy without clearness, a diplomacy without honor, had converted the great power founded by Frederick into a body without a soul. There began a new war of which the incidents are almost precisely parallel to those of the war which had so lately closed. As the

Austrians at Ulm, so now Napoleon crushed the Prussians at Jena and Auerstädt (October 14th) before the appearance of the Russians; as he entered Vienna, so now he entered Berlin (October 27th); as he fought a second war in Moravia, in which Austria played a second part to Russia, so now from November, 1806, to June, 1807, he fought in East Prussia against the Russians aided with smaller numbers by the Prussians; as he might then, after all his successes, have been ruined by the intervention of Prussia, so now, had Austria struck in, he might have found much difficulty in making his way back to France; as at Austerlitz, so at Friedland in June, 1807, the Russians ran hastily into a decisive battle in which they ruined their ally but not themselves; as Austria at Pressburg, so Prussia at Tilsit signed a most humiliating treaty, while Russia, as before, escaped, not this time by simply retiring from the scene, but by a treaty in which Napoleon admitted her to a share in the spoils of victory.

Here was a second catastrophe far more surprising and disastrous than that which it followed so closely. The defeat of Austria in 1805 had been similar to her former defeats in 1800 and 1797; Ulm had been similar to Hohenlinden, the treaty of Pressburg to that of Lunéville. But the double defeat of Jena and Auerstädt, in which the duke of Brunswick, the old general not only of 1792 but of the Seven Years' War, found his death, dissolved forever the army of the great Frederick; and it was followed by a general panic, surrender of fortresses, and submission on the part of civil officials, which seemed almost to amount to a dissolution of the Prussian state. Prussia was partitioned between Saxony, Russia, and a newly established Napoleonic kingdom of Westphalia. Her population was reduced by one-half, her army from 250,000 to 42,000 (the number fixed a little later by the treaty of September, 1808), and Napoleon contrived also by a trick to saddle her for some time with the support of a French army of 150,000 men. She was in fact, and continued till 1813 to be, a conquered state. Russia on the other hand came off with more credit, as well as with less loss, than in the former campaign. At Eylau in January, 1807, she in part atoned for Austerlitz. It was, perhaps, the most murderous battle that had been fought since the wars began, and it was not a victory for Napoleon. Friedland, too, was well contested.

The empire as founded in 1804 did not, perhaps, differ so much from the consulate after Marengo as both differed, alike in spirit and in form, from the empire such as it began to appear after Pressburg and was consolidated after Tilsit. Between 1800 and 1805 Napoleon, under whatever title, was absolute ruler of France, including Belgium, the left bank of the Rhine, Savoy, and Nice, and practically also ruler of Holland, Switzerland, and North Italy to the Adige, which states had a republican form. The title emperor meant in 1804 little more than military ruler. But now emperor has rather its mediæval meaning of paramount over a confederacy of princes. Napoleon had become a king of kings. The Bonaparte family, which before had contended for the succession in France, so that Joseph actually refused, as beneath him, the crown of Italy, now accepted subordinate crowns. Joseph became king of Naples, the Bourbon dynasty having been expelled immediately after the peace of Pressburg; Louis became king of Holland; Jerome, the youngest brother, received after Tilsit a kingdom in North Germany composed of territory taken from Prussia, of Hanover, and of the electorate of Hesse-Cassel, which had shared the fall of Prussia; somewhat earlier Murat, husband of the most ambitious of the Bonaparte sisters, Caroline, had re-

ceived the grand-duchy of Berg. By the side of these Bonaparte princes there were the German princes who now looked up to France, as under the Holy Roman Empire they had looked up to Austria. These were formed into a confederation in which the archbishop of Mainz (Dalberg) presided, as he had before presided in the empire. Two of the princes had now the title of kings, and, enriched as they were by the secularization of church lands, the mediatization of immediate nobles, and the subjugation of free cities, they had also the substantial power. A princess of Bavaria wedded Eugène Beauharnais; a princess of Württemberg Jerome Bonaparte. At its foundation in 1806 the Confederation had twelve members, but in the end it came to include almost all the states of Germany except Austria and Prussia.

A change seemed to take place at the same time in Napoleon's personal relations. In 1804, though the divorce of Josephine was debated, yet it appeared to be Napoleon's fixed intention to bequeath his crown by the method of adoption to the eldest son of Louis by Hortense Beauharnais. But this child died suddenly of croup in the spring of 1807, while Napoleon was absent in Germany, and the event occurring at the moment when he attained his position as king of kings probably decided him in his own mind to proceed to the divorce.

It was impossible to give crowns and principalities to the Bonaparte family without allowing a share of similar distinctions to the leading politicians and generals of France. He was therefore driven to revive titles of nobility. When, in 1802, he received the life-consulate, he had proceeded instantly to create new dotations for the senators; now he felt that he must devise for them still more splendid bribes. His first plan was to give them feudal lordships outside France. Thus Berthier, his most indispensable minister, became sovereign prince of Neufchatel, Bernadotte sovereign prince of Pontecorvo, Talleyrand sovereign prince of Benevento. Especially out of the Venetian territory, given to France at Pressburg, were taken fiefs (not less than twelve in all), to which were attached the title of duke. These innovations fell in 1806, that is, in the middle of the period of transformation. But after Tilsit, when Napoleon felt more strongly both the power and the necessity of rewarding his servants, he created formally a new noblesse and revived the *majorat* in defiance of the revolutionary code. In the end, besides the three sovereign princes just mentioned, he created four hereditary princes (Berthier is in both lists) and thirty-one hereditary dukes. There were also many counts and barons. The system was prodigiously wasteful. Of public money Berthier received more than \$250,000 a year, Davoust about \$150,000, nine other officials more than \$50,000, and twenty-three others more than \$20,000.

As in 1805 he had been drawn into the conquest of Germany in the course of a war with England, so now he assailed all the neutral powers, and shortly afterward violently annexed Spain, not so much from abstract love of conquest as in order to turn against England the forces of all the Continent at once. In addition to that limited right which the belligerent has by international law to prevent by blockade the trade of a neutral with the enemy and to punish the individual trader by confiscation of ship and goods, Napoleon now assumed the right of preventing such commerce without blockade by controlling the neutral governments. English goods were to be seized everywhere, and the harbors of neutrals to be closed against English ships under penalty of war with France. Such a threat, involving a claim to criticize and judge the acts of neutral governments and to

inflict on them an enormous pecuniary fine, was almost equivalent to the annexation at one stroke of all the neutral states. The other instrument had a similar character. The French fleet having been crippled at Trafalgar, he proposed now to reinforce it by all the other fleets in Europe, and to get possession of all the resources of all the maritime states. His eyes, therefore, became now fixed on Denmark, Portugal, and Spain.

Such was Napoleon as king of kings, and such were his views. This unique phase of European history lasted five years, reckoning from the treaty of Tilsit to the breach with Russia. Europe consisted now of a confederacy of monarchical states looking up to a paramount power. The confederacy was held together by the war with England, which it put under an ineffective commercial blockade, suffering itself in return a more effective one. But Napoleon felt that Spain and Portugal must be brought under his immediate administration, in order that their maritime resources might be properly turned against England. Austria also had by no means been sufficiently humbled, and Prussia was humbled so intolerably that she was forced into plans of insurrection.

By two conventions signed at Fontainebleau on October 27th the partition of Portugal was arranged with Spain. The Prince of the Peace was to become a sovereign prince of the Algarves, the king of Spain was to have Brazil with the title of emperor of the two Americas, etc., but the main provision was that a French army was to stand on the threshold of Spain ready to resist any intervention of England. The occupation of Portugal took place soon after, Junot arriving at Lisbon on November 30th, just as the royal family with a following of several thousands set sail for Brazil under protection of the English fleet. At the same time there commenced in defiance of all treaties a passage of French troops into Spain, which continued until 80,000 had arrived, and had taken quiet possession of a number of Spanish fortresses. At last Murat was appointed to the command of the army of Spain. He entered the country on March 1, 1808, and marched on Madrid, calculating that the king would take flight and take refuge at Seville or Cadiz. A rising unparalleled for its suddenness and sublime spontaneousness took place throughout Spain and speedily found a response in Germany. A new impulse was given, out of which grew the great nationality movement of the nineteenth century. Meanwhile Napoleon, having first offered the throne of Spain to his brother Louis, who refused it, named Joseph king, retaining, however, a reversion to himself and heirs in default of male heirs of Joseph, who had only daughters. But it must have become clear to Napoleon almost at once that he had committed the most enormous of blunders. Instead of gaining Spain he had in fact lost it, for hitherto he had been master of its resources without trouble, but to support Joseph he was obliged in this same year to invade Spain in person with not less than 180,000 men. With Spain, too, he lost Portugal, which in June followed the Spanish example of insurrection, and had Spain henceforth for an ally and not for an enemy. Hitherto he had had no conception of any kind of war not strictly professional. He had known popular risings in Italy, La Vendée, and Egypt, but had never found it at all difficult to crush them. The determined insurrection of a whole nation of 11,000,000 was a new experience to him.

Thus the monarchy of Tilsit suffered within a year the most terrible rebuff. Napoleon himself now appeared upon the scene. His first step was to revive the memory of Tilsit by a theatrical meeting with Alexander, which was arranged at Erfurt in September. At the same time he checked the rising spirit of resistance in Prussia by driving from office the great reforming minister

Stein. At the beginning of November he was ready for the invasion of Spain. Joseph had retired to Vittoria, and the armies of the insurrection fronted him along the Ebro under the command of Blake, Castaños, and Palafox. Between November 7th and 11th the army of Blake was dissolved by Lefebvre, and Napoleon entered Burgos, which was mercilessly pillaged; on the 23d Castaños was defeated at Tudela by Lannes; by December 2d Napoleon, having forced the mountain passes, was before Madrid, and on the 4th he was in possession of the town, where, endeavoring somewhat late to conciliate the liberalism of Europe, he proclaimed the abolition of the Inquisition and of feudalism, and the reduction of the number of convents to one-third. He remained in Spain till the middle of January, 1809, but he was not allowed repose during the interval. Sir John Moore had advanced from Portugal as far as Salamanca, and determined in the middle of December to assist the insurrection by marching on Valladolid. Soult was at Carrion and was threatened by this advance, since the English force, after Moore had effected his junction with Baird, who arrived from Coruña, at Majorga, amounted to 25,000 men. Napoleon hoped to cut its communications, and so deal one of his crushing blows at the enemy with whom he was always at war yet whom he never, except at Waterloo, met in the field. He set out on the 22d with about 40,000 men, and marched 200 miles in ten days over mountains in the middle of winter. Moore saw the danger, retired to Benavente, and blew up the bridges over the Ezla. Napoleon advanced as far as Astorga; but he had missed his mark, and professed to receive information which showed him that he was urgently wanted at Paris. He returned to Valladolid, whence on January 19th he set out for France. The end of Moore's expedition belongs to English history.

Another storm was indeed gathering. The downfall of Austria, in 1805, had been out of all proportion to her military inferiority; it was impossible that she should acquiesce in it. The year that had followed Tilsit had given her quite a new prospect. Spain, which before had given Napoleon help, now swallowed up 300,000 of his troops, so that in the autumn of 1808 he had been obliged to withdraw from Prussia the large army which he had kept for more than a year quartered on that unhappy country. Napoleon could spare only half his force, and there was now no doubt that Prussia would be as hostile to him as she dared. Stein and Scharnhorst had been preparing a *levée en masse* in Prussia and an insurrection in the new kingdom of Westphalia. Under such circumstances began the war of 1809, which may be called the First German War of Liberation, under the leadership of Austria. Napoleon accused Austria of arming, of wanting war; Austria expostulated, but in vain; and war began. It began early in April, and the proclamation of the archduke Charles was addressed to the whole German nation. The watchword of Austria against France was now liberty and nationality. A good general conception of the war may be obtained by comparing it with that of 1805, which it resembles in certain large features. Again there was a short but decisive passage of arms in Bavaria; in a five days' struggle, celebrated for Napoleon's masterly maneuvers, the Austrians were driven out of Ratisbon, and the way to Vienna was laid open. Again Napoleon entered Vienna (May 13th). But the war in Italy this time began farther east, on the Piave. Eugène Beauharnais, after an unfortunate commencement, when he was defeated at Sacile by the archduke John, made a successful advance, and being joined by Marmont, who made his way to him from Dalma-

via by way of Fiume, drove the Austrian army into Hungary, defeated them at Raab, and effected a junction with Napoleon at Bruck. Then, as before, the war was transferred from Vienna to the other side of the Danube. But the Austrian resistance was now far more obstinate than in 1805. From the island of Labau Napoleon threw his troops across the river in the face of the archduke. A battle took place which occupied two successive days, and is sometimes called the battle of the Marchfeld, but is sometimes named from the villages of Gross-Aspern and Essling. Like that of Eylau in 1807 it was among the most terrible and bloody battles of the period. In all perhaps 50,000 men fell, among whom was Marshal Lannes, and the French were driven back into their island. Once more, however, Napoleon's skill and fortune prevailed. On the night of July 4th he succeeded, under cover of a false attack, in throwing six bridges from Lobau to the left bank of the Danube, over which more than 100,000 men passed before morning and were arrayed upon the Marchfeld. The obstinate battle of Wagram followed, in which by a miscalculation which became the subject of much controversy, the archduke John came too late to his brother's help.

What was expected in Germany had happened already in the Peninsula. Arthur Wellesley had landed at Lisbon on April 22d, and in less than a month had driven Soult in confusion out of Portugal. In July he undertook an invasion of Spain by the valley of the Tagus. Thus both the quantity and quality of resistance to Napoleon was greater than at any former time; but it was scattered, and the question was whether it could concentrate itself.

But England was unfortunate this time in her intervention. The armament did not set sail till August, when in Austria the war seemed to be at an end, and when Wellesley, after winning the battle of Talavera, had seen himself obliged to retire into Portugal, and it was directed not to Germany but against Antwerp. It was therefore a mere diversion, and as such it proved unsuccessful.

And so the last triumph of Napoleon was achieved, and the treaty of Schönbrunn was signed on October 20th. By this treaty, as by former treaties, he did not merely end a war or annex territory, but developed his empire and gave it a new character. He now brought to an end the diumvirate which had been established at Tilsit. Since Tilsit his greatness had been dependent on the concert of Russia. He had had the czar's permission to seize Spain, the czar's coöperation in humbling Austria. But he could not thus discard Russia without making her an enemy, and accordingly the Russian war appeared on the horizon at the very moment that the Austrian war was terminated. This transformation was accomplished by first humbling Austria, and then, as it were, adopting her and giving her a favored place in the European confederacy. She lost population to the amount of 3,500,000, besides her access to the sea; she paid an indemnity of more than \$15,000,000, and engaged to reduce her army to 150,000. But, thus humbled, a high and unique honor was reserved for her. We cannot be quite certain whether it was part of Napoleon's original plan to claim the hand of an archduchess, though this seems likely, since Napoleon would hardly break with Russia unless he felt secure of the alliance of Austria, and yet in the treaty of Schönbrunn he does not hesitate to offend Russia by raising the Polish question. What is certain is that after his return to France Napoleon proceeded at once to the divorce from Josephine, that at the same time he asked the czar for the hand of his sister, that upon this Austria, alarmed, and seeing her own doom in the Russian match, gave him to

understand (as he may very well have calculated that she would do) that he might have an archduchess, and that upon this he extricated himself from his engagement to the czar with a rudeness which might seem intended to make him an enemy. At the same time he refused to enter into an engagement not to raise the Polish question.

At an earlier period we saw Napoleon urged by his brothers to divorce Josephine, but refusing steadfastly and apparently resolved upon adopting the eldest son of Louis and Hortense. He had now quite ceased to be influenced by his brothers, but at the same time he had risen to such greatness that he had himself come to think differently of the question.

The archduchess Marie Louise, who now ventured to take the seat of Marie Antoinette, seems to have been of amiable but quite insignificant character. Her letters were childlike. She became a complete Frenchwoman, but, owing to a certain reserve of manner, was never specially popular. On March 20, 1811, she bore a son, who took the title of King of Rome, by which in the Holy Roman Empire the successor had been designated. France had thus become once more as monarchical as in the proudest days of Versailles; but the child of the empire was reserved for what his father called "the saddest of fates, the fate of Astyanax."

As in 1805 Napoleon had brought Austria and Russia on himself by attacking England, so in 1810 he pressed his hostility to England to the point that it broke the alliance of Tilsit and led to a Russian war.

The year 1810 was occupied with this heightening of the Continental system and the annexations which it involved. That he had long contemplated the annexation of Holland appears from the offer of the crown of Spain which he made to Louis in 1808, and the language he then used. He now took advantage of the resistance which Louis made to his ruinous exactions. Louis was driven to abdicate, and the country was organized in nine French departments. In August the troops of the king of Westphalia were forced to make way for French troops at the mouths of the Elbe and Weser, and a few months later the whole coast between the Rhine and the Elbe was annexed. At the same time Napoleon began to make war on neutral commerce, especially American, affirming that in order to complete the destruction of English trade it was only necessary to prohibit it when it made use of neutral bottoms. So thoroughly in earnest was he with his Continental system; and indeed it is beyond dispute that great distress and discontent, nay, at last a war with the United States, were inflicted upon England by this policy.

But the pressure of it was felt even more on the Continent, and the ultimate cause of the fall of Napoleon was this, that under the weight of the Continental system the alliance of Tilsit broke down sooner than the resistance of England. That alliance had been seriously weakened by the Austrian marriage, and by Napoleon's refusal to give the guarantees which Russia required that Poland should never be restored.

In 1811 the alliance of Tilsit gradually dissolved. Napoleon's Russian expedition is hardly to be regarded as a freak of insane pride. He himself regarded it as the unfortunate effect of a fatality, and he betrayed throughout an unwonted reluctance and perplexity. The truth is, he could not now stop. Upon the Continental system he had staked everything. He had united all Europe in the crusade against England, and no state, least of all such a state as Russia, could withdraw from the system without practically joining England. For an ordinary war his resources were greatly superior to those of Russia. A campaign on the Lithuanian frontier

would no doubt have been unfavorable to Alexander, and might have forced him to concede the points at issue. Napoleon had already experienced in Spain the danger of rousing national spirit. It seems, however, that this lesson had been lost on him, and that he still lived in the ideas which the campaigns of 1805, 1806, and 1807 had awakened, when he had occupied Vienna and Berlin in succession, overthrown the Holy Roman Empire, and conquered Prussia. He made a dispute about tariffs the ground of the greatest military expedition known to authentic history. War with France meant for Russia sooner or later alliance with England, but Napoleon was not able to get the help of Turkey, and Sweden joined Russia. Against Russia, Sweden, and England (a coalition which formed itself but tardily) Napoleon assembled the forces of France, Italy, and Germany, and hoped to win, as usual, by the rapid concentration of an overwhelming force. The army with which he invaded Russia consisted of somewhat more than 600,000 men—the French troops mainly commanded by Davoust, Oudinot, and Ney, the Italian troops by Prince Eugène, the Poles by Poniatowski, the Austrian contingent (33,000 men) by Schwarzenberg, the remaining German troops by Gouvion St. Cyr, Reynier, Vandamme, Victor, Macdonald (who had the Prussian contingent), and Augereau.

Russia had been easily defeated at Austerlitz and Friedland, where it fought far from home for a cause in which it was but slightly interested. Against an invasion it was as invincible as Spain, being strengthened by a profound national religion and perfect loyalty to the Government; in addition it had the strength of its vast extent, its rigorous climate, and the half-nomad habits of its people. By his prodigious preparations Napoleon provoked a new national war under the most difficult circumstances, and yet he appears to have desired peace and to have advanced most reluctantly. His campaign ran the same course as against Austria in 1805 and 1809. There was the successful advance, the capture of the fortress (Smolensk), the great victory (at Borodino), the entry into the capital (Moscow); but of all this no result. No negotiation followed, and Napoleon suddenly found himself helpless, as perhaps he would have done in 1805 and 1809, had the enemy shown the same firmness. On May 16, 1812, he arrived with Marie Louise at Dresden, where for the last time he appeared as king of kings—the emperor of Austria, the king of Prussia, a multitude of German sovereigns, Metternich, and Hardenberg paying court to him. On the 28th he set out again and traveled by Glogau, Thorn, Dantzig, Königsberg, Gumbinnen, to Wilkowsky, where he arrived on June 21st. On the 24th the mass of the army passed the Niemen at Kovno, and on the 28th Napoleon entered Vilna, which was evacuated by the Russians. Here he remained till July 16th. Alexander, who had by this time gained greatly in decision of character, refused to negotiate while the enemy stood on Russian territory; Napoleon in conversation with Balacheff showed an almost pathetic desire for an amicable arrangement. He was embarrassed again when a deputation from Warsaw, where a diet had met, asked him only to say that "*Poland exists*, since his decree would be for the world equivalent to the reality." This word he declined to say, alleging his obligations to Austria. From his conversations with Narbonne (Villemain, *Souvenirs*) we find that he had deliberately considered and rejected what we may call the rational mode of waging war with Russia, that is, through the restoration of Poland.

In relating this war we have to beware of national exaggerations on both sides. On Napoleon's side it is absurdly said that he was only vanquished by winter.

whereas it is evident that he brought the winter upon himself, first by beginning so late, then by repeated delays, at Vilna, at Vitebsk, and most of all at Moscow. On the other side we must not admit absolutely the Russian story that he was lured onward by a Parthian policy, and that Moscow was sacrificed by a solemn universal act of patriotism. As usual Napoleon took the enemy by surprise, and brought an overwhelming force to the critical point. When he crossed the Niemen the Russians were still thinking of an offensive war, and rumors had also been spread that he would enter Volhynia. Hence their force was divided into three armies: one, commanded by the Livonian Barclay de Tolly, had its headquarters at Vilna, a second under Prince Bagration was further south at Volkowysk, the third under Tormasoff was in Volhynia. But the total of these armies scarcely amounted to 200,000 men, and that of Barclay de Tolly opposed little more than 100,000 to the main body of Napoleon's host, which amounted nearly to 300,000. Barclay was a German, and might well seem another Melas or Mack. A cry arose for his dismissal, to which the czar responded by putting old Kutusoff, who was at least a Russian, at the head of all his armies. This change necessarily brought on a great battle, which took place on September 6th near the village of Borodino. More than 100,000 men and about 600 pieces of artillery were engaged on each side. It ended in a victory, but an almost fruitless victory, for the French. They lost perhaps 30,000 men, including Generals Montbrun and Caulaincourt, the Russians nearly 50,000, including Prince Bagration. Here again Napoleon displayed unwonted indecision. He refused to let loose his guard, consisting of 20,000 fresh troops, who might apparently have effected the complete dissolution of the hostile army, and materially altered the whole sequel of the campaign. He said, "At 800 leagues from Paris one must not risk one's last reserve."

This battle, the greatest after Leipsic of all the Napoleonic battles, was followed by the occupation of Moscow on September 14th, which, to Napoleon's great disappointment, was found almost entirely empty. After a council of war held at Fili, Kutusoff had taken the resolution to abandon the old capital, the loss of which was held not to be so irreparable as the loss of the army. But, as with Old Russian craft he had announced Borodino to the emperor as a victory, the sensation produced upon the Russian public by the fall of Moscow was all the more overwhelming. Nor did the next occurrence, which immediately followed, at first bring any relief. Fires broke out in Moscow on the night after Napoleon's entrance; on the next night, by which time he was quartered in the Kremlin, the greater part of the city was in flames, and on the day following he was forced by the progress of the conflagration to evacuate the Kremlin again.

- It is indeed not clear that this event had any decisive influence upon the result of the war. Nor does it seem to have been the deliberate work of the patriotism of Moscow. The beginner of it was one man, Count Rostopchin, governor of Moscow, who is shown by many public utterances to have brooded for some time over the thought, and is proved to have made preparations for carrying it into effect before leaving the town. It is, however, supposed that what was begun by him was completed by a rabble which had no object but plunder, and partly by French soldiers. After planning a demonstration on St. Petersburg, weighing Daru's scheme of wintering in Moscow (which he called "un conseil de lion"), and waiting in vain for the czar's submission, Napoleon set out on October 18th after blowing up the Kremlin. He marched southward to Kaluga, hoping to make his way through a richer and unexhausted

country. But while his force had dwindled the Russian had increased. Peace with Sweden had released a Russian force in Finland; peace with Turkey released the army of the Danube; meanwhile levies were proceeding through the whole empire. He reached Smolensk on November 9th, when he might have been at Vilna. He marched by Orca to the Berezina, which he struck near Borisoff. Here Tchitchagoff at the head of the Danube army confronted him, and two other Russian armies were approaching. Napoleon on his side was joined by what remained of the corps of Oudinot and Victor, who had held the line of the Dwina. But what was the army of Napoleon which was thus reënforced?

In July it had consisted of more than 250,000 men. It had suffered no decisive defeat, and yet it amounted now only to 12,000; in the retreat from Moscow alone about 90,000 had been lost. The force which now joined it amounted to 18,000, and Napoleon's star had still influence enough to enable him to make his way across the Berezina, and so escape total ruin and captivity. But December came on, and the cold was more terrible than ever. On the evening of December 6th a miserable throng, like a crowd of beggars, tottered into Vilna.

The corps of Macdonald, Reynier, and Schwarzenberg (among whom were included the Austrian and Prussian contingents) had escaped destruction, having been posted partly on the Polish frontier, partly in the Baltic provinces. For these we may deduct 100,000 from the total force; it then appears that half a million had perished or disappeared. They had perished not by unexpected cold; "the cold had but finished the work of dissolution and death almost accomplished by the enemy, by hardship, and especially by hunger;" nor is cold unusual in Russia in November. Napoleon's error was one which may be traced as clearly in the campaigns of 1805 and 1806, the error of making no provision whatever for the case of ill-success or even success less than complete. The campaign of 1812 left everything in civilized history far behind it.

But what was Napoleon's position? Any government but the strongest would have sunk under such a blow, but Napoleon's government was the strongest, and at its strongest moment. Opposition had long been dead; public opinion was paralyzed; no immediate rising was to be feared. Should he then simply take the lesson home, and make peace with Alexander? This was impossible; he must efface the disaster by new triumphs. But, as this was evident to all, Alexander could not but perceive that he must not lose a moment, but must hasten forward and rouse Germany before Napoleon should have had time to levy a new army. 1813 must be filled with a war in Germany, as 1812 with the war in Russia.

Napoleon left the wreck of his army at Smorgoni on December 5th (as he had left his Egyptian army thirteen years before), traveling in a carriage placed upon a sledge and accompanied by Caulaincourt and Duroc. He had an interview with Maret outside Vilna, and then traveled to Warsaw, where he saw his ambassador De Pradt, who has left an account of his confused talk. From Warsaw he passed to Dresden, where he saw his ally the king of Saxony, and wrote letters to the emperor of Austria, and to the king of Prussia. He then made his way by Erturt and Mainz to Paris, where he arrived on December 18th. The bulletin had appeared two days before.

He had said to De Pradt that he intended to raise 300,000 men and be on the Niemen ~~again~~ in the spring. The first part of this intention he fulfilled, for in April he reappeared in the field with 300,000 men; but the

campaign was fought not on the line of the Niemen, nor of the Vistula, nor of the Oder, and he had to fight a battle before he could even reach the Elbe, for a great event took place less than a fortnight after his arrival in Paris, the defection of the Prussian contingent under York from the grand army. This event led to the rising of Prussia against Napoleon. York's convention with the Russians is dated December 30th. On January 22, 1813, Stein appeared at Königsberg and procured the assembling of the estates of East Prussia, in which assembly the Prussian landwehr was set on foot. On February 27th he concluded for the czar the treaty of Kalisch with Prussia, by which the old Coalition of 1806 may be said to have been revived. Prussia now rushed to arms in a wholly new spirit, emulating Spain and Russia in devotion, and adding to devotion an intelligence peculiar to herself. At the same time measures were taken to break up the Confederation of the Rhine. Tettenborn cleared the French out of the northern departments in March; Saxony, too, passed into the hands of the allies, and it was hoped that the king himself might be induced to follow the example of the king of Prussia. But April came, and Napoleon took the field again.

By rapidity and energy he was still able to take the offensive. Though Russia and Prussia were now as Spain, yet the process of calling out and drilling their population was only just begun, and it proceeded slowly. Their united available force at the opening of the campaign scarcely exceeded 100,000 men. Austria and the middle states did not abandon Napoleon. With tact and with judicious concession he might yet retrieve his position; perhaps no one, as yet, had begun to think of his fall. He left Paris for Mainz on April 15th. His object was Saxony, where Dresden, the scene of his last display of omnipotence less than a year ago, was now the residence of the czar and the king of Prussia united against him. Eugène was maintaining himself on the lower Saale with an army of about 70,000 men, and Napoleon was to march by way of Erfurt to join him. Between Erfurt, Bamberg, and Mainz he had by this time about 150,000 men, troops indeed without discipline and with imperfect drill, youths, the last hope of France; but well officered and not wanting in the enthusiasm which his name still inspired. There was, however, a serious deficiency of cavalry. Meanwhile Davoust, stationed on the Weser with 30,000 men, was holding down the insurrection of North Germany.

The war which now commenced ended not only to the disadvantage of Napoleon, but unlike any former war it ended in a complete defeat of France, nay, in the conquest of France, an event to which nothing parallel had been seen in modern Europe. Meanwhile we remark that the war, though technically one, was really three distinct wars. There was first the war with Russia and Prussia which occupied the month of May, and was concluded by an armistice on June 4th. There was next a war with Russia, Prussia, and Austria, which began in August and was practically terminated in October by the expulsion of Napoleon from Germany. Thirdly, there was an invasion of France by the same allied powers. This began in January, 1814, and ended in April with the fall of Napoleon.

In the first of these wars Napoleon maintained on the whole his old superiority. It has excited needless admiration that with his raw levies he should still have been able to win victories, since of his two enemies Russia had suffered as much as himself in 1812, and Prussia's army was at the beginning of the year actually to make. In the first days of May he advanced down the valley of the Saale, making for Leipsic by Naumburg, Weissenfels, and Lützen. On the 2nd was fought

the battle commonly called from Lützen, though the Germans usually name it from the village of Gross-Görschen. By this battle, in which the great military reformer of Prussia, Scharnhorst, received the wound of which he died soon after, the allies were driven to retreat across the Elbe, and Dresden was restored to the king of Saxony. Another battle was fought on May 20th and 21st at Bautzen on the Spree. Here again Napoleon remained master of the field, though his loss seems to have been considerably greater than that of the enemy. The allies retired into Silesia, and a pause took place, which led to the armistice of Poischwitz, signed on June 4th. During this armistice Napoleon formed the resolution which led to his downfall.

He might seem now to have almost retrieved his losses. If he could not revive the great army of the Revolution which lay buried (or unburied) in Russia, he had reasserted the ascendancy of France. Politically he had suffered but one substantial loss, in the rebellion of Prussia.

At Tilsit Napoleon had dissolved the Coalition by forming as it were a partnership with Russia. It might seem possible now to form a similar partnership with Austria. This course had indeed been entered upon at the marriage of the archduchess. Napoleon seems to have taken this alliance seriously. He conceived it as the final suppression of the Revolution, as a complete adhesion on his own part to conservatism. The language of the bulletins at this time is ultra-conservative. Thus the enemy is described as "preaching anarchy and insurrection." Stein is charged with "rousing the rabble against the proprietors." But, though he had borrowed the Austrian tone, he had not yet enlisted Austrian interests on his side. The ledger-dominion by which, in 1800, 1805, 1806, Napoleon had made conquests was now worn out; his blows were no longer followed by abject submission and surrender; he was not even able, for want of cavalry, to make his victories decisive. Thus ample concessions to Austria were indispensable, but, these assumed, his position might seem good.

He took the momentous resolution to make no such concessions, saw Austria join the Coalition, and after a campaign of two months found himself driven in tumultuous ruin across the Rhine. This step is the counterpart of Tilsit, and destroyed the work of Tilsit. A treaty had just been signed at Reichenbach by which Austria had engaged, as mediating power, formally to offer conditions of peace to Napoleon and to declare war on him in case of refusal. She proceeded to offer the conditions above mentioned with the exception of that which refers to the Confederation of the Rhine. A congress met at Prague in the course of July, but Napoleon did not allow its deliberations to make serious progress. He paid no attention to an ultimatum presented on August 8th. On midnight of August 10-11, the armistice was declared to be at an end, and the doom of Napoleon was sealed.

Europe now plunged again into a struggle as desperate and as destructive as that of 1812. More evidently even than in 1812 was Napoleon responsible for this ruin of all civilization. He could not any longer speak even of the liberty of the seas, for he was forced himself to admit that the Continental system was dead, and yet refused to surrender that ascendancy for which the Continental system had all along been the pretext. Infatuated France, however, had by this time furnished more than 400,000 men to perish in a contest where there might be chances, but could be no probabilities of victory. His headquarters were now at Dresden, and his armies ranged along the whole course of the Elbe

from Bohemia to its mouth. This position had been somewhat weakened by the adhesion of Austria to the Coalition, for Austria massed her troops on the north-west of Bohemia, threatening Dresden and Napoleon's communications from the left side of the Elbe. The force of the allies (approaching 500,000 men) consisted of three great armies, of which the first, principally Austrian, and commanded by Prince Schwarzenberg, was stationed on the Eger in Bohemia; the sovereigns were there. The old Prusso-Russian army, which had made the convention of Poischwitz, was still in Silesia. It contained more Russians than Prussians, but a Prussian officer was now put at the head of it. This was Blücher, the dashing general of hussars, now an old man of seventy years; on his staff were some of the leading theorists and enthusiasts of the new Prussian army, such as Gneisenau. But the bulk of the Prussian force were stationed in the mark of Brandenburg. In this final muster of the armies of Europe we see that the moral forces had passed over from France to the allies. In the French camp there reigned weariness and desire for peace, among the Prussians and Russians heroic ardor and devotion. But the old mismanagement reappeared on the side of the allies.

The campaign opened with a blow aimed at Berlin, where perhaps Napoleon wished to extinguish the popular insurrection at its source. Oudinot marched on it from Baruth, and was supported by a force from Magdeburg; Davoust sent another corps from Hamburg. Bernadotte proposed to retire and sacrifice Berlin, but in spite of him Bülow fought on August 23d the battle of Grossbeeren, within a few miles of the capital. Here first the landwehr distinguished itself, and Berlin was saved. The attack from Magdeburg was defeated by Hirschfeld at Hagelberg on the 27th. Meanwhile Napoleon himself, at the head of 150,000 men, had marched against Blücher on the Katzbach. Blücher retired before him, and he was compelled to return to the defense of Dresden, but he left Macdonald with perhaps 50,000 or 60,000 men to hold Blücher in check. Almost immediately after his departure (August 26th) Macdonald was defeated by Blücher in the battle of the Katzbach. Thus the campaign began with two Prussian victories. But when the great army of Bohemia moved upon Dresden Napoleon showed his old superiority. On August 27th he inflicted on it a terrible defeat. In this battle Moreau, the hero of Hohenlinden, was mortally wounded by a cannon-ball. It seemed for a moment likely that this battle, followed up with Napoleon's overwhelming rapidity, would decide the campaign. But the news of Grossbeeren and Katzbach arrived; Napoleon is also said to have been attacked by illness; he altered his plan in the moment of execution. The grand stroke of the campaign failed, and, instead of cutting off the retreat of the grand army, Vandamme was taken prisoner at Kulm with 10,000 men after a battle in which he had lost half that number (August 30th). It was evident that the times of Marengo and Austerlitz were over. Napoleon's ability and authority were as great as ever; he controlled larger armies; he opposed a Coalition which was as unwieldy as former Coalitions; and yet he had suffered four defeats in a single week and had won but one victory. Within another week he suffered another blow. A new advance was made on Berlin by Ney, who was defeated with great loss at Dennewitz by the Prussians under Bülow (September 6th).

Here then ended Napoleon's ascendancy; henceforth he fought in self-defense or in despair. Yet the massacre was to continue with unabated fury for two months longer. He spent the greater part of September in

restless marches from Dresden, now into Silesia, now into Bohemia, by which he wore out his strength without winning any substantial advantage. Toward the end of the month a new phase of the war began. From the beginning the allies had given each other rendezvous in the plain of Leipsic. Hitherto Napoleon had held the line of the Elbe, and had presented a single mass to the three separate armies of the Coalition. Now that his collapse began to be visible, began the converging advance on Leipsic. The Silesian army crossed the Elbe at Wartenburg on October 3d, and on the next days the northern army also crossed at several points. At the same moment the Confederation of the Rhine began rapidly to dissolve. A troop of Cossacks under Czernicheff upset the kingdom of Westphalia (October 1st). Bavaria abandoned Napoleon, and concluded the treaty of Ried with Austria (October 8th). But for form's sake a final massacre was still necessary. It took place on a satisfactory scale between October 14th and 19th, and ended in the decisive defeat of Napoleon and the capture of Leipsic. Perhaps nearly half a million of men were engaged in these final battles. It is reckoned that in the last three days the Prussians lost 16,000, the Russians 21,000 and the Austrians 14,000 men—total, 51,000. Napoleon left 23,000 behind him in the hospitals and 15,000 prisoners; his dead may have been 15,000. He lost also 300 pieces of artillery. The sufferings of the wounded almost exceeded anything told of the retreat from Moscow.

The work of eight years was undone; Napoleon was thrown back to the position he had occupied at the rupture of the peace of Amiens. The Russian disasters had canceled Friedland; Leipsic had canceled Austerlitz. But he might by abdicating have spared France, already mortally exhausted, the burden of another war. It is among the most unpardonable even of his crimes to have dragged his unhappy country through yet another period of massacre, though nothing that could even appear to be a national interest was at stake. In November advances were made to him by the allies, in which peace was proposed on the basis of the "natural frontiers." This would have secured to France the main fruits of the First Revolutionary War, that is, Belgium, the Left Bank, Savoy, and Nice. Such terms seem generous when we consider the prostration of France and the overwhelming superiority of the allies.

On December 1st, the allies issued their manifesto from Frankfort, in which they declared themselves at war not with France but with Napoleon (an imitation of the Revolutionary principle, "Peace with peoples, war with Governments"), and the invasion followed with almost Napoleonic rapidity. The three armies remained separate as they had been in Germany. The great army under Schwarzenberg passed through Switzerland, and made its way to the plateau of Langres (the source of the Seine, Aube, and Marne), where it began to arrive about the middle of January; Blücher's Silesian army crossed the middle Rhine to Nancy; the northern army, nominally under Bernadotte, passed through Holland. In the course of the march Switzerland and Holland were swept into the Coalition, the resources of which were become overwhelming. It would be difficult to state for what object Napoleon now called on France to fight another campaign, particularly as the allies guaranteed to her a larger territory than she had possessed under the old monarchy. His officers indeed wondered what personal object he could have. They were astonished to hear him talk of another campaign in Germany to be undertaken next spring, of being soon on the Vistula again, etc.

He was no doubt a prey to illusions, his fortune having accustomed him to expect results ten times greater than the probabilities justified, but his confidence was founded on (1) the great force which still remained to him shut up in German fortresses, (2) the mutual jealousy of the allies, (3) his own connection with the emperor of Austria, (4) the patriotism which would be roused among the French, as in 1792, by the invasion. But his calculations were confounded by the rapidity of the invaders, who gave him no time to call out the nation. The Senate did indeed grant him 300,000 men, but to levy, drill, and arm them was impossible, and he had neglected to fortify Paris. In the armies which had returned from Germany there began desertion of all who were not French. The campaign opened at the end of January and was over at the end of March. The scene of it was the country between the Marne, Aube, and Seine, partly also the department of Aisne. At first, though successful at Brienne, Napoleon seemed unable to resist the superior numbers of the enemy. He was defeated at La Rothière. But the invaders were as yet irresolute; they divided their forces. This gave him an opportunity. He attacked Blücher, and, though with greatly inferior forces, won four battles in four days, at Champaubert (February 10th), at Montmirail (11th), at Château-Thierry (12th), at Vauchamps (13th). For the moment this brilliant success gave the campaign quite another character; the hopes and patriotic feelings of the French were roused. A congress had already been opened at Châtillon, and under the impression of these victories it would have been easy to conclude a peace, had not Napoleon's position made a reasonable peace inadmissible to him. He felt this, and fell back upon illusions and upon attempts to sever Austria from the Coalition. At the beginning of March the Coalition was strengthened by the treaty of Chaumont, in which each of the four powers bound themselves for twenty years to keep 150,000 men on foot. Directly afterward Napoleon received a crushing blow from the fall of Soissons and the junction of Blücher with the northern army under Bülow, which had entered France by way of Holland and Belgium. Their united force amounted to more than 100,000 men. The battles of Craonne and Laon followed, in which Napoleon, without suffering actual defeat, saw his resources dwindle away. On March 18th the conference at Châtillon came to an end, the plenipotentiaries of the allies declaring Napoleon to have no intention but that of gaining time. About the 24th the allies came to the resolution to march on Paris. They had before them only Marmont and Mortier, for Napoleon himself had resolved to maneuver in their rear, and had marched to St. Dizier. The marshals, after an engagement at Fère Champenoise, made good their retreat to Paris, where the enemy followed them on the 29th. Joseph Bonaparte withdrew Marie Louise and the king of Rome to Tours. On the 30th the allies attacked in three divisions—the Silesian army on the side of Montmartre, Prince Eugene of Würtemberg and Barclay de Tolly by Pantin and Romainville, the crown prince of Würtemberg and Giulay by Vincennes and Charenton. In the afternoon, after an obstinate resistance, the marshals offered a capitulation, and engaged to evacuate the town before seven o'clock in the morning. Napoleon, advancing by forced marches, was too late. The military struggle was over; the political struggle began.

But not even the germs were visible of any authority that could replace that of Napoleon. Should he be succeeded by another general, or by a regency for his son, or by the Bourbons? The first course might have been possible had some Moreau been at hand;

even as it was, Bernadotte, who, like Napoleon, was a Jacobin developed into a prince, made pretensions which were favored by the czar. Such a course would have been a revival of the consulate, but it would not have satisfied the republican party, while it would have been rejected by monarchists of every shade. In favor of the regency, as against the Bourbons, there was much to be said. It would not begin with a fantastic transformation scene, and it would have a hold on the popular imagination. The decision fell out by a sort of accident. To a regency the natural road was by an abdication which would preserve the principle of inheritance. Such an abdication Napoleon gave. On April 4th he reviewed his troops at Fontainebleau, and announced his intention of attacking the allies in Paris. They received his words with enthusiasm; but just at this point the mainstay of his power failed him. The military aristocracy, the marshals, refused to follow him, and Napoleon perceived in a moment that the end was come. Though in arguing with them he had said that a regency of Marie Louise, whom he called "a child," was impossible, yet he now abdicated on condition that his son should succeed under the regency of the empress. Ney, Macdonald, and Caulaincourt set out for Paris to negotiate the establishment of the regency.

While the marshals forced him to abdicate, his reign had been brought to an end in a wholly different way by the Senate. Talleyrand, vice-president of this body, who had for some time been intriguing in favor of the Bourbons, pronounced openly in favor of them before the sovereigns when they entered Paris. He convoked the Senate on April 1st, and on April 2d it voted the deposition of Napoleon and his family. This decision was ratified the next day by the Corps Législatif.

Then occurred the abdication in favor of his family, which had the support of the army. The instrument was brought to Paris by not less than three famous marshals, Ney and Macdonald having been joined on their way from Fontainebleau by Marmont. The two solutions were thus brought together before the allied sovereigns, of whom Alexander was not favorably disposed to the Bourbons, and Francis was the father of Marie Louise. For a moment the balance trembled.

But Marmont had been brought into contact, during his defense of Paris, with Talleyrand, and had committed himself to him before he knew of the view of the marshals. After evacuating Paris he had been stationed on the Essonne. Here he had entered into an engagement to place his corps at the service of the new provisional government which the Senate had constituted; the arrangement was that on April 5th the corps should quit its position and march into Normandy. But when the marshals passing through his camp from Fontainebleau told him of their commission, he had revealed his secret with expressions of penitence; he had countermanded his orders to the inferior officers and had gone with the marshals to Paris. In his absence, however, General Souham, influenced by a fear that the plot had become known to Napoleon, gave orders to the troops to march on to Versailles. This appearance of division in the army was fatal to Napoleon's family. It decided Alexander to declare for the Bourbons, and Caulaincourt was instructed to demand from Napoleon an abdication pure and simple. In return he was to retain the title of emperor, and to have the island of Elba in sovereignty, while Marie Louise was to have a principality in Italy.

By an irony of fortune the government founded at Brumaire, in which everything had been sacrificed to military efficiency, was the only one of the three governments of France since 1789 which actually suc-

cumbed before an invader. The total result of so many conquests was that France, which, when Napoleon's name was first heard of, was in substantial possession of Belgium, the left bank of the Rhine, Savoy, and Nice, had now lost the first two acquisitions; and we shall see what measures he took to deprive her of the other two.

In the meantime, however, all the hatred, long suppressed, of individuals and of parties broke loose upon him. For the moment he seems to have utterly lost heart. On the night of April 11th, after signing the unconditional abdication, he is said to have taken a dose of a poison which ever since the Russian campaign he had kept by him. But vomiting, we are told, came on and saved him. On the 20th, when he bade farewell to his soldiers, he had resolved to live in order "to narrate to posterity the great deeds we have done together." He soon found another object for life; but a year later, after another downfall far more complete and ignominious, he clung to life, and he clung to it afterward in captivity. The soldiers idolized him still, and his parting scene at Fontainebleau, when he kissed the eagle, was pathetic; but when he reached the south of France he met with other demonstrations of feeling. At Avignon and Orgon the crowd attacked the carriages, and wanted to throw the tyrant into the Rhone. He was compelled to disguise himself. At the coast he was met by an English frigate which landed him on May 4th at Porto Ferrajo, in Elba. It seems to have been arranged among the sovereigns that his wife and child were not to rejoin him, nor did he complain of this. Marie Louise set out on April 23d, and was at Schönbrunn again before the end of May. About the same time Josephine died at Malmaison, in the arms of her children Eugene and Hortense.

It must have occurred to Napoleon very soon after his arrival in Elba that he was not yet driven to autobiography. Never was a great state in a position so untenable and monstrous as France after he quitted the helm. In twenty years of thrilling events, in the emotions first of tragedy and then of epic poetry, the French had forgotten the Bourbon court, when suddenly the old Comte de Provence (under the name of Louis XVIII.) and the Comte d'Artois, Condé and the Duc d'Angoulême, and the Orpheline du Temple, reappeared and took possession of the country before even a royalist party had formed itself in France. Politically, indeed, they brought liberty, for they created a parliament where all assemblies had been mute and servile for fourteen years; but they unsettled all domestic affairs, the position of public men, the prospects of the army, the title of estates, in a manner so sudden and intolerable, and that at a moment when the country had suffered conquest from without, that some new convulsion seemed manifestly imminent. Disgraced, bewildered, and alarmed at the same time, the French could think with regret even of the reign of Napoleon. Another event happened which was like a new revolution. The prisoners and the troops shut up in German fortresses returned to France under the treaty, perhaps not less than 300,000 men. What could be more evident than that if all these soldiers could take the field again, and under Napoleon, France might yet escape the humiliation of a government imposed by foreigners, and perhaps also recover her lost frontiers? The congress of Vienna entered upon business in September, and from this time a new chapter of politics opened. France ceased to be the general bugbear, and new alliances began to be formed in order to check the aggressive spirit of Russia.

It was not the first time that Napoleon had gone into a sort of exile. As he had disappeared in the East,

and returned to make Brumaire, so he might come from Elba to rescue France. The situation was not less intolerable than 1799. As then, so now, had he not returned, a revolution would, nevertheless, have taken place. Fouché was weaving a military plot, which would have carried to power perhaps the duke of Orleans, perhaps the king of Rome.

Napoleon entered upon the last of his thousand adventures on February 20, 1815, when he set sail from Porto Ferraio with Generals Bertrand and Drouot and 1,100 soldiers. On March 1st, he reached the French coast between Cannes and Antibes. Twenty days after he entered the Tuileries in triumph.

He had judged the feeling of the army correctly, and also the effect which would be produced by his prodigious fame. These causes were more than enough to overthrow a government so totally without root as that of the Bourbons. From the coast he took the way across the mountains of Provence by Sisteron and Gap to Grenoble. The soldiers sent from this town to stop him were disarmed when he uncovered his breast and asked, Which of them would fire on his emperor? He was then joined by the royalist La Bédoyère. MacDonald at Lyons stood firm, but was deserted by his soldiers. Ney, who commanded in the east, at first declared himself violently against his old chief, but the military feeling afterward gained him, and he joined Napoleon at Auxerre. The king left the Tuileries on the 19th, retiring northward, and on the next day Napoleon entered Paris.

At Brumaire he had put down Jacobinism, and given the nation order and repose. Now he was summoned, in the name of liberty, to protect the acquisitions of the Revolution and to defend the national honor against the triumphant foreigner. The Hundred Days are the period of popular or democratic imperialism. Those who sided with him told him frankly that he must turn over a new leaf, and he professed himself ready to do so. It would be rash to say that this was impossible. He was but forty-five; his return from Elba was an astonishing proof that he still possessed that elasticity of spirit, that power of grasping the future, which he had often shown so remarkably. Here then, as at a second Brumaire, might begin a third Napoleonic period. The mad crusade against England and the world-empire which sprang out of it were now to be forgotten; he was to stand out as a hero of national independence and of modern ideas together, a representative of the free modern people against the Holy Alliance. This last and most surprising of his transformations was already most prosperously begun. But at this point fortune deserted him once and for all. Napoleon Liberator remained a poetical idea, transforming his past life into legend, and endowing French politics with a new illusion; the attempt to realize it came to an end in a hundred days (March 13th to June 22d).

The ultimate cause of this failure seems to have been a change in Napoleon himself. It had long been remarked that the emperor Napoleon was wholly different from the general Bonaparte of the Italian campaigns. Bonaparte had been lean, shy, laconic, all fire and spirit, the very type of republican virtue imagined by Rousseau; the emperor was fat and talkative, and had his fits, according to Marmont, of indolent ease. Once or twice there had been attacks of illness, by which he had been temporarily incapacitated; but these had been hushed up. On the whole he had never yet been wanting to himself. In the campaign of 1814 his activity had been prodigious, and the march to Paris in twenty days, with which he had opened 1815, had been a great display of vigor. But he could not maintain himself at this level. A physical decay had begun in him, affect-

ing through his body, not indeed his mind, but his will and his power of application.

The constitutional history of the Hundred Days may be dispatched summarily, since it led to nothing. On March 13th an imperial decree was issued from Lyons dissolving the two chambers established by the Bourbons, and convoking an extraordinary assembly in Field of May for the purpose "of correcting and modifying our constitutions and of assisting at the coronation of the empress, our dear and well-beloved spouse, and of our dear and well-beloved son." But the prospect soon changed, and, as it was necessary that the empire, like the monarchy, should have its charter, it seemed impossible to wait till May. Napoleon had recourse to Benjamin Constant, that is, he marked his change of policy by sending for the leader of the opposition. The "Acte Additionnel aux Constitutions de l'Empire," dated April 22d, was drawn by Constant, examined by a committee, and then adopted by the council of state. The most remarkable feature of it is the preamble, in which he explains his change of attitude by saying that "formerly he had endeavored to organize a grand federal system in Europe, which he had regarded as agreeable to the spirit of the age and favorable to the progress of civilization," that "for this purpose he had adjourned the introduction of free institutions," but that "henceforward he had no other object but to increase the prosperity of France by strengthening public liberty." This neat misrepresentation deserves notice as having imposed on many people. For the rest it is to be observed that this act creates an hereditary peerage. The Field of May was held, but not till June 1. Napoleon appeared in a grand costume and distributed flags, but the "well-beloved spouse and son" were not there; Europe had declared against him. On the 12th he set out for the campaign.

The great powers had issued, immediately on hearing of Napoleon's disembarkation (March 13th), a declaration putting him outside all civil and social relations, and consigning him to public vengeance as "an enemy and disturber of the peace of the world." On March 25th they reconstituted the Coalition. To be freely accepted by the French people, and then to be rejected by Europe, gave him precisely the opportunity he sought as standing forth as the heroic champion of national independence. He had now all the soldiers who at the time of his first fall had been locked up in fortresses or foreign prisons. His position was therefore such as it had been in 1813, not in 1814, and he proposed to defend not a vast empire but simply France, so that he had on his side patriotism and liberalism. For the moment, however, the inequality of numbers was great. In June the allies had in the field more than 700,000, Napoleon little more than 200,000, men. There were already English troops in Belgium, where they were engaged in establishing the new kingdom of the Netherlands, and there were Prussian troops in the Rhenish province which had just been given to Prussia. It was a question for Napoleon whether he should assume a defensive attitude and allow the allies to invade France—this in itself would have suited his new policy best—or carry the war into Belgium, a country long united with France, and attack the English and Prussians. He shrank from inflicting a new invasion upon France, especially on account of the strength of the royalist party in many regions, and thus it was that the scene of the campaign was laid in Belgium. The English had their headquarters at Brussels, the Prussians at Liège. He formed the plan of dividing them and beating them in turn, as he had served the Austrians and Sardinians at the very beginning of his career. Many circumstances, however, were different. Wellington

and Blücher with Gneisenau were superior to Colli and Beaulieu; the Napoleon of 1815 was vastly inferior to the Bonaparte of 1796. Of all the Napoleonic campaigns this was by far the most rapid and decisive. Even the Marengo campaign had lasted a month, but this was decided in three days. Leaving Paris on the 12th, Napoleon was in Paris again on the 21st, his own fate and that of his empire and that of France decided. Everything concurred to make this short struggle the most interesting military occurrence of modern history up to that time: its desperate intensity, its complete decisiveness, the presence for the first and last time of the English army in the front of the European contest, the presence of the three most renowned commanders, Napoleon, Wellington, and Blücher.

Napoleon's army amounted to 122,401 men; it contained a large number of veterans, besides many who had seen the campaigns of 1813-14, and was perhaps the finest army he had ever commanded. That of Wellington was composed of Englishmen, Hanoverians, Brunswickers, Nassauers, Germans, and Netherlanders; the total is stated at 105,950. But in the Netherlands of the newly-established kingdom no confidence could be placed, and yet these amounted to nearly 30,000; the English, too (about 35,000), were in great part raw recruits (the Peninsular veterans being mainly absent in America); altogether Wellington pronounced it "the worst army ever brought together." The army of Blücher numbered 116,897 disciplined troops, animated by an intensely warlike spirit. Napoleon's opening was prosperous. He maintained so much secrecy and used so much rapidity that he succeeded in throwing himself between the two armies. On the 15th he advanced and occupied Charleroi. On the 16th he engaged the Prussians at Ligny and the English at Quatrebras, desiring to block the cross-road between Quatrebras and Sombreffe, and so to sever the two armies. Napoleon personally commanded against the Prussians, and here he gained his last victory. The battle was very bloody; about 12,000 Prussians fell, and Blücher himself was wounded. At Quatrebras Ney met Wellington and was forced to retreat. But the defeat of Blücher made it necessary for Wellington to retire on Brussels in order to effect a junction with the Prussians. The 17th was spent in this retrograde movement, and on the 18th Wellington accepted battle on the heights of St. Jean, from which the French name it, while the English give it the name of Waterloo, a village four miles nearer to Brussels, where Wellington wrote his dispatch. He accepted battle in full reliance upon the help of the Prussians, who are not, therefore, to be considered as having saved him from defeat.

Military writers point out several errors, some of them considerable, committed by Wellington, but their criticism of Napoleon, which begins by sweeping away a mass of falsehood devised by himself and his admirers in order to throw the blame upon others, is so crushing that it seems to show us Napoleon after his brilliant commencement acting as an indolent and inefficient general. He first, through mere want of energy, allows the Prussians to escape him after Ligny, and then sends Marshal Grouchy with 33,000 men in the wrong direction in pursuit of them. Owing to this mismanagement Grouchy is at Wavre on the day of the battle of Waterloo, fighting a useless battle against the Prussian corps of Thielemann, while Blücher is enabled to keep his engagement to Wellington. Everywhere during these days Napoleon appears negligent, inactive, inaccessible, and rather a Darius than an Alexander, so that it has been plausibly maintained that he was physically incapacitated by illness. The battle itself was one of the most remarkable and terrible ever fought, but it was perhaps

on both sides rather a soldiers' than a generals' battle. It consisted of five distinct attacks on the English position:—(1) an attack on the English right by the division Reille, (2) an attack on the left by the division D'Erlon (here Picton was killed), (3) a grand cavalry attack, where the splendid French cavalry "foamed itself away" upon the English squares, (4) a successful attack by Ney on La Haye Sainte (which Wellington is thought to have too much neglected; it was after this that the French prospect seemed brightest), (5) the charge of the guard. In the middle of the third act of this drama the Prussians began to take part in the action. The battle seems to have begun about 11:30, and about 8 o'clock in the evening the cry "Sauve qui peut" rose from the guard. A general advance of the English decided the victory, and then the pursuit was very thoroughly accomplished by the Prussians under Gneisenau. Napoleon at first took refuge in a square. At Genappe he left this, and arrived at Charleroi about daybreak with an escort of about twenty horsemen.

He lost probably more than 30,000 out of 72,000 men, but the grand army was utterly dissolved. The whole loss of the allies was somewhat more than 22,000. Had Napoleon been victorious, he would but have opened the war prosperously, for half a million soldiers, in addition to those of Wellington and Blücher, were on the march for France; being completely defeated, he had no resource, but was ruined at once. France was conquered, as she had been conquered the year before; but her second fall appears far more humiliating and dismal than her first, when we consider how enthusiastically she had rallied to Napoleon and how instantaneously Napoleon and she had been struck down together. The second abdication took place on June 22d. "I offer myself a sacrifice to the hatred of the enemies of France. My public life is finished, and I proclaim my son emperor of the French." On the 25th he retired to Malmaison, where Josephine had died the year before. When his son was passed over by the Chamber of Representatives, who named an executive commission of five, he protested that he had not intended to make way for a new Directory. On the 27th he went so far as to offer his services once more as general, "regarding myself still as the first soldier of the nation." He was met by a refusal, and left Malmaison on the 29th for Rochefort. He lingered some days at Rochefort, where he had arrived on July 3d, and then, finding it impossible to escape the vigilance of the English cruisers, went on the 15th on board the *Bellerophon* and surrendered himself to Captain Maitland. It was explained to him that no conditions could be accepted, but that he would be "conveyed to England to be received in such manner as the prince regent should deem expedient." He had written at Rochefort the following characteristic letter to the prince regent:—"Royal Highness—A prey to the factions which divide my country and to the enmity of the greatest powers of Europe, I have terminated my public career, and I come, like Themistocles, to seat myself at the hearth of the British people. I place myself under the protection of its laws, which I claim from your royal highness as the most powerful, the most constant, and the most generous of my enemies."

It was perhaps the only course open to him. In France his life could scarcely have been spared, and Blücher talked of executing him on the spot where the Duc d'Enghien had fallen. He therefore could do nothing but what he did. His reference to Themistocles shows that he was conscious of being the worst enemy that England had ever had. Still he might reflect, on the other hand, that England was the only country which had not been trampled down and covered with

massacre by his soldiers. It would have been inexcusable if the English Government had given way to vindictive feelings, especially as they could well afford to be magnanimous, having just won the greatest of all victories. But it was necessary to deprive him of the power of exciting new wars, and the experiment of Elba had shown that this involved depriving him of his liberty. The frenzy which had cost the lives of millions must be checked. This was the principle laid down in the declaration of March 15th, by which he had been excommunicated as a public enemy. It was therefore necessary to impose some restraint upon him. He must be separated from his party and from all the revolutionary party in Europe. So long as he remained in Europe this would involve positive imprisonment. The only arrangement, therefore, which would allow him tolerable personal comfort and enjoyment of life was to send him out of Europe. From these considerations grew the decision of the government to send him to St. Helena. An act of Parliament was passed "for the better detaining in custody Napoleon Bonaparte," and another act for subjecting St. Helena to a special system of government.

He was kept on board the *Bellerophon* till August 4th, when he was transferred to the *Northumberland*. On October 15th, he arrived at St. Helena, accompanied by Counts Montholon, Las Cases, and Bertrand, with their families, General Gourgaud, and a number of servants. In April, 1816, arrived Sir Hudson Lowe, an officer who had been knighted for bringing the news of the capture of Paris in 1814, as governor.

The rest of his life, which continued till May 5, 1821, was occupied partly in quarrels with this governor, partly in the task he had undertaken at the time of his first abdication, that of relating his past life. He did not himself write this narrative, nor does it appear that he ever dictated it word for word. It is a report made partly by General Gourgaud, partly by Count Montholon, of Napoleon's impassioned recitals; but they assure us that this report, as published, had been read and corrected throughout by him. It gives a tolerably complete account of the period between the siege of Toulon and the battle of Marengo. On the later periods there is little except a memoir on the campaign of 1815, to which the editors of the *Correspondence* have been able to add another on Elba and the Hundred Days.

These memoirs have often been compared to the *Commentaries* of Cæsar, and their value would indeed be priceless if they related to a period imperfectly known. But an age which has abundance of information, and takes history very seriously, is struck particularly by the elaborate falsifications which they contain. A vast number of misstatements, many of them evidently intentional, have been brought home to him, and in several cases he has tried to foist into history apocryphal documents.

Here, as throughout his life, he showed quite a peculiar talent for misrepresentation. He knew that nine readers out of ten take a lucid statement for a true one, and his statements were always lucid, precise, and direct. And thus it has been, and is, particularly difficult to eradicate the Napoleonic legend, which has grown up in the very midst of the nineteenth century, and would perhaps never have been seriously shaken but for the failure of the Second Empire. By looking only at the beginning and end of his career, and by disregarding all the middle of it, an imaginary Napoleon has been obtained who is a republican, not a despot, a lover of liberty, not an authoritarian, a champion of the Revolution, not the destroyer of the Revolution, a hero of independence, not a conqueror, a friend of the people, not a contemner of the people, a man of heart and virtue,

not a ruthless militarist, cynic, and Machiavellian. This illusion led to the restoration of the Napoleonic dynasty in 1851.

Napoleon died of an ulcer in the stomach on May 5, 1821. He was buried at Longwood in St. Helena; but in the reign of Louis Philippe his remains were removed by permission of the English Government to the Invalides at Paris, where a stately dome was erected over the sarcophagus that contains them.

NAPOLEON II. is the name given by Bonapartists to François Charles Joseph, duke of Reichstadt, the son of Napoleon I. and Marie Louise, who was born at Paris, March 20, 1811, and died of laryngeal phthisis at Schönbrunn, near Vienna, July 22, 1832. His empty imperial title is derived from his father's two abdications in his favor in 1814 and 1815. He was created duke of Reichstadt in 1818 by his grandfather, Francis I. of Austria, at whose court he resided after his father's fall.

NAPOLEON III. Louis Napoleon, Emperor of the French, was the younger son of Louis, king of Holland (brother of Napoleon I.), and of Hortense, daughter of the empress Josephine by her first husband Beauharnais. He was thus both nephew and step-grandson of Napoleon I. His father and mother were on the worst terms, and rarely lived together. Louis was born at Paris on April 20, 1808, at the house belonging to his mother in the street that is now Rue Lafitte. He was brought up at Paris, and was occasionally taken to the Tuileries and noticed by the emperor, who gave him the cordon of the Legion of Honor. But it is impossible that the child could have remembered much of Napoleon I., who, from the beginning of the Russian campaign in 1812, was constantly away from Paris. When, in 1814, the allies entered the French capital, generosity toward the conquered was the order of the day. Queen Hortense was courteously treated and visited by the czar Alexander, to whom her boy is said to have given a ring. The family continued to reside in France during the first restoration of the Bourbons, and were there when Napoleon returned from Elba.

The second restoration of the Bourbons was not effected in so gentle a spirit as the first. The family of the Bonapartes was banished from France. Hortense—who, like the rest of her kindred, had enriched herself out of public property—retired to Switzerland, and purchased the chateau of Arenenberg, overlooking the Lake of Constance. The next fifteen years were passed by the young Louis partly at Arenenberg and partly at Augsburg, which his mother chose as the place of his education. He grew up a gentle, studious, brooding youth, and the influence of his Augsburg schooling remained both in his habits of thought and in his German-like pronunciation, which was noticeable long afterward. Until 1830 he attracted little attention from those around him, and none at all from the world, for he was as yet only one among several cadets of the Napoleonic house, Napoleon's own son, the duke of Reichstadt, being still alive. He seems, however, to have had dreams of a great future at an early age; and the instinct that some knowledge of military affairs would be useful to him led him to serve as an artillery volunteer in the Swiss camp of Thun under Colonel Dufour. The revolution of 1830, which dethroned the Bourbons and awoke insurrectionary movements in so many countries, first launched Louis Napoleon upon his eventful career. Along with his elder brother he joined the Italian bands who were in revolt against the rule of the pope in Romagna. This revolt was put down by Austrian soldiers. The elder of the two brothers fell ill and died at Forlì; Hortense, setting out to rescue her sons from their danger, found one dead and the other ill with fever, and on the point of

falling into the hands of the Austrians at Ancona. After nursing Louis through his illness she succeeded in carrying him away in disguise, and the mother and son, after a perilous journey, reached France, which they had not seen for sixteen years. They arrived in Paris in April, 1831; but the law banishing the Bonapartes was still in force, and the Government of Louis Philippe did not allow them to remain there more than twelve days. They were sent on, like other exiles, to England, and stayed for some weeks in London, from which they returned to Arenenberg. Louis, now twenty-three years old, was beginning to form the political theories which the memory of the first empire and the actual state of affairs in France under Louis Philippe naturally suggested to a thoughtful and ambitious mind. A pamphlet called *Political Reveries*, containing the draft of a constitution for France, and an *Essay on Switzerland, Political and Military*, were written by him in 1832-33.

Louis remained quiet for some years in Switzerland, but the death of the duke of Reichstadt in 1832 had made him presumptive head of the house of Bonaparte, his uncle Joseph, the actual head, having no sons; and, in company with some adventurous friends, he formed the design of overthrowing Louis Philippe's government by presenting himself to the army. On October 28, 1836, he came to Strasburg, and, after passing the next day in consultations with Colonel Vaudrey and a few officers who were in the plot, appeared at the quarters of the 4th artillery regiment, which Vaudrey commanded. This regiment welcomed him, and Louis then went on to the infantry barracks, where, however, the enterprise ended disastrously. He was arrested and imprisoned, and, after a short interval, sent to America by Louis Philippe without trial. He had not long been in the United States when he received a letter from his mother stating that she was about to undergo a dangerous operation. He returned to Switzerland in time to see her before her death (October 5, 1837), denying, probably with truth, that he had made any promise to Louis Philippe to remain absent from Europe. A pamphlet on the Strasburg affair, which was now published at his instigation by one of his companions, Lieutenant Laity, led the French ministry to demand his expulsion from Switzerland. The Swiss Government declining to expel him, and difficulties with France becoming imminent, Louis voluntarily withdrew from the country and went to England. He lived there for the next two years, leading the life of a man of fashion, and associating with persons of prominence in society and on the turf. Among the gayeties of the time in which he took a part was Lord Eglinton's famous tournament. His real interests, however, were of a more serious character, and in the autumn of 1839 he published the treatise *Des Idées Napoléoniennes*, a vigorous but sophistical account of Napoleon's work as an administrator and organizer, and of his foreign policy. This work was intended by its author to prepare the way for a new attempt against Louis Philippe; and in August, 1840, while the body of Napoleon was being brought back from St. Helena, he made his second descent upon France. Above fifty persons assisted him on this occasion, the best-known being Count Montholon, a companion of Napoleon I. in his exile. A ship was chartered, and the conspirators landed at Boulogne, carrying with them a tame eagle. The enterprise had not even the gleam of success which attended the expedition to Strasburg. No one joined them, and within an hour or two those of the party who were not shot or drowned in attempting to escape were lodged in prison. Louis was now brought to trial before the Chamber of Peers, where he was defended

by Berryer. He was condemned to perpetual imprisonment, and the castle of Ham, on the Somme, was chosen as the place of his captivity. For the next six years Louis remained in confinement.

At the end of six years, after asking in vain for permission to visit his father, who was dying, Louis effected his escape, disguising himself with the aid of his faithful friend and fellow-prisoner, Doctor Conneau, as a workman, and walking out of the gates of the castle with a plank over his shoulder (May 25, 1846). He went again to London, and it is characteristic of the life of exile and imprisonment which he had hitherto passed that he heard for the first time a French tragedy performed when Rachel played in London in July, 1846. He was now again in the fashionable world, and he appears to have been compelled to raise large sums of money from money-lenders. The house in which he lived was No. 10 King street, St. James'. In February, 1848, Louis Philippe lost his throne. Louis Napoleon at once set off for Paris, offering his services to the provisional Government. He was, however, requested to withdraw from France, and did so. In April, 1848, during the Chartist disturbances, he was serving in London as a special constable. But his name was kept before the public in France; he was put up for election to the assembly, and was elected at Paris and in three departments. As a Bonapartist movement was now evidently beginning, the executive commission demanded authority to arrest Prince Louis as an avowed pretender. This, however, was refused by the assembly, and it was voted that he should take his seat. Louis, however, had the astuteness to remain in the background until the workmen's insurrection of June was over, declaring himself unwilling to be the cause of any disturbance. The insurrection was put down by Cavaignac, reaction set in, and Louis now appeared upon the scene as the candidate of order and the representative of authority. His first appearance in the assembly was on September 26, 1848; and in December he was elected president of the republic by above 5,000,000 votes, Cavaignac, who was second on the list, receiving 1,500,000, and Lamartine a few thousands. On assuming office he swore in the presence of God to remain faithful to the republic, and to fulfill the duties imposed on him by the constitution. From this time the political history of Louis Napoleon is the history of France.

The principal foreign affair of his presidency was the expedition to Rome, in which, for the sake of anticipating the action of Austria, French troops put down the Roman republic by force, and restored the pope to his sovereignty. Abroad this gained for Louis Napoleon the bitter hostility of Italian patriots, who remembered him as a companion in insurrection against the pope in 1831; and it was one of the many inconsistencies of his position that he was at once a friend of Italian freedom in his heart and yet, as the "man of order" and the "savior of society" in France, dependent to a great extent upon the support of the priesthood. On December 2, 1851, he executed the *coup d'état*, which made an end of constitutional government. Approved at first by an enormous majority of the French people, and even by English public men of the type of Palmerston, this act is now almost universally recognized as a disastrous crime. The sham constitution which was promulgated by the president immediately afterward lasted less than twelve months. In the following November a plebiscite was taken upon the question whether the imperial dignity should be reestablished in the person of Louis Napoleon, and an affirmative answer was given by nearly 8,000,000 voters, against a dissentient minority of 250,000. The empire was inaugurated on the anniversary of the *coup d'état*

and for eighteen years Louis Napoleon was sovereign of France. The first ten years of his reign were successful, and in some respects brilliant. His marriage with Eugénie de Montijo, countess of Téba (January 30, 1853), placed beside him a figure which long charmed Paris and its visitors. Adhering to the alliance with England which, since 1830, had served France well against the three eastern courts, Napoleon III. entered into war against Russia. He had always represented the restoration of Poland to be one of the tasks left by his uncle to France; and, had his army encountered fewer difficulties in the Crimea, or had the German powers shown any inclination to take part in the struggle against Russia, he would probably have made some serious attempt to restore at least the duchy of Warsaw. But he was no soldier himself; the war proved a serious and embarrassing matter, and in the end Napoleon was far more anxious to make peace than his English ally. The second nationality which associated itself with Napoleonic history, and which had been crushed by the treaties of 1815, was the Italian. Napoleon III. had warning that the cause of Italy could not be safely abandoned. In January, 1858, Orsini attempted to take his life. Whether or not the act of Orsini and the letters which he wrote from prison had the effect of quickening the emperor's determination to do something for Italy may be disputed; but the time had now come, and in the interviews which took place between Napoleon and Cavour at Plombières in the autumn of 1858 the alliance between France and Sardinia against Austria was arranged. In the spring of 1859 French armies entered northern Italy, and the emperor himself took command. On June 4th he witnessed the battle of Magenta, and on the next morning entered Milan in company with Victor Emmanuel. During the battle of Solferino on June 24th, he gave directions from the tower of the church of Castiglione. He met the emperor of Austria at Villafranca on July 11th, and there agreed to those preliminaries of peace which so deeply disappointed the hopes that had been excited by his own words—"Italy free from the Alps to the Adriatic." Venice was left to Austria; Lombardy under the *Mincio* alone was liberated; and the subsequent union of the peninsula under the house of Savoy was no work of Napoleon III., whose own plan was to form an Italian federation under the presidency of the pope, and in virtual dependence upon France. Nevertheless the expulsion of Austria from Lombardy was in itself so great a blow that the later effects, though not foreseen by Napoleon, naturally resulted from it.

The annexation of Nice and Savoy to France excited great uneasiness in the British Government, but the treaty of commerce between France and England, which was signed in January, 1860, gave the emperor a popularity in England which he retained even after his fall. With the termination of the Italian war and the inauguration of a policy of free trade the rule of Napoleon III. had reached its best. His ill-judged interference in the affairs of Mexico ended disastrously; the part played by France in reference to the Danish War of 1864 was weak and inconsequent; and when the great struggle between Prussia and Austria was impending Napoleon appears to have been duped by Bismarck, and to have expected to gain Rhenish territory without taking up arms. Meanwhile the splendor of the court, the continuous improvements in Paris, the rapid growth of wealth throughout France, the subservience of officials, deputies, and journalists, had veiled the decline of administrative energy and the progress of corruption and mismanagement. At length, after the establishment of a great North-German power in 1866, the prestige of the emperor unmistakably sank. He had to loosen the

reins of government at home; and yet the grant of any degree of liberty appeared to jeopardize his own existence. Failing in health, in confidence, in reputation, he was hurried into the war of 1870 by the clerical party at court, and by advisers who saw no help for his dynasty but in a successful war. He was present with his only child (Napoleon Eugène Louis, born March 16, 1856, killed in Zululand, June 1, 1879), at the bombardment of Saarbrücken on August 2d, and then retired into Metz, which he left on the 15th, the day between the battles of Gourcelles and Mars-la-Tour. The empress insisted on the relieving movement which was then undertaken by MacMahon, and the emperor, going with the army, was made prisoner with 90,000 men at Sedan on September 2d. He was sent to the castle of Wilhelmshöhe, near Cassel, from which he subsequently retired to England. He lived with the empress at Chislehurst, and died there on January 9, 1873.

NAPOLEON, a round game of cards. Any number may play; about four or five makes the best game. When six play the dealer deals himself no hand, but pays or receives the same as the other players. A pack of fifty-two cards is required. The players cut for deal; the lowest deals. The cards rank as at whist; and the deal goes afterward in rotation to the left, as at whist. The cards are shuffled, and cut to the dealer, who deals each player five cards by one at a time, as at whist. The deal being completed, the player to the dealer's left looks at his hand, and declares how many tricks he will play for (called "standing"). Some players make it compulsory for the eldest hand to declare one trick at least; but if this rule is not in force the eldest hand may decline to play, when he says "I pass." If the eldest hand passes, the next player to the left has a similar option of standing or passing, and so on all round. As soon as anyone stands, the next player after him must either pass or stand for more tricks than the one before him, and so on all round. If all pass, the hand is not played, and the player to the dealer's left deals. Some players compel the dealer to play for at least one trick. The stand-hand plays against all the others. He has the first lead, and the first card he leads makes the trump suit. Each player plays one card at a time in rotation, as at whist, except that the played cards remain face upward on the table in front of the persons playing them. The cards played, one by each player, constitute a "trick." The players must follow suit if able. If unable to follow suit a player may play any card he pleases. No one is obliged to head the trick or to trump. If the stand-hand succeeds in making at least the number of tricks he stood for he wins; if not he loses. If he wins he receives from each of the other players the amount previously agreed on for each trick stood for; if he loses he similarly pays all the others. If any one declares "Nap," *i.e.*, that he will play for all five tricks, no subsequent player can stand. The hand is played as before. If the player declaring Nap wins he receives double stakes all round; if he loses he only pays single stakes all round.

NARA, the oldest of the successive capitals of Japan, is situated in the north of Sakai *ken* (province of Yamato), about sixty-five miles east of Osaka, on the slope of a range of picturesque hills, beautifully wooded with cryptomerias, evergreen oaks, the rare *Podocarpus Nageia*, etc. From 710, when it was chosen as her residence by Gemmei Tenno, till 794, when Kioto was founded by Kuwammu Tenno, Nara was the chief seat of the mikados. In 1899 (though hardly a tenth of its former size) it had a population of about 30,539.

NARBADA. See **NERBUDDA**.

NARBONNE, a city of France, chief town of an *arrondissement* in the department of Aude, lies five

miles from the Mediterranean. The cathedral (St. Just) is the third on the site, and dates from the close of the thirteenth century, when the choir (130 feet high) was built. Two towers were added in the fifteenth century. The population is 28,134.

NARBOROUGH, SIR JOHN, naval commander, was descended from an old Norfolk family. He received his commission in 1664, and in 1666 was promoted lieutenant for gallantry in the action with the Dutch fleet off the Downs in June of that year. After the peace he was chosen to conduct a voyage of exploration in the South Seas. He set sail from Deptford on November 26, 1669, and entered the Straits of Magellan in October of the following year, but returned home in June, 1671, without accomplishing his original purpose. In 1675 he was sent to suppress the Tripoline pirates, and by the bold expedient of dispatching gunboats into the harbor of Tripoli at midnight and burning the ships he induced the dey to agree to a treaty. Shortly after his return he undertook a similar expedition against the Algerines. In 1680 he was appointed commissioner of the navy, an office he held till his death in 1688.

NARCISSUS, a genus of bulbous plants belonging to the family *Amaryllidaceae*. There are twenty or thirty wild forms, natives of central Europe and the Mediterranean region, while one extends through Asia to Japan. From these, or rather from some of these, by cultivation and hybridization, have arisen the very numerous forms which adorn our gardens in spring.

NARCOTICS are substances having the physiological action, in a healthy animal, of producing lethargy or stupor, which may pass into a state of profound coma or unconsciousness along with complete paralysis, terminating in death. Certain substances of this class are used in medicine for the relief of pain, and are then called anodynes, while another group produces profound sleep, and are consequently known as hypnotics. In one sense, anæsthetics, such as chloroform and ether, may be held to be narcotics, but, as they are usually volatile substances causing unconsciousness for a comparatively short time, they are conveniently separated from the true narcotics, the effects of which are much more lasting. These distinctions are to a great extent artificial, as it is evident that a substance capable of producing partial insensibility to pain, or sleep, will inevitably in larger doses cause profound coma ending in death. Hence we find the same substances sometimes classed as anodynes and at other times as hypnotics. For example, small doses of opium, or of one or other of its preparations, relieve pain, while larger doses act as hypnotics, causing deep sleep passing into coma. As examples of anodynes, we have opium and some of the alkaloids in it, *Cannabis indica* or Indian hemp, belladonna and its alkaloid atropia, hyoscyamus or henbane and its alkaloid hyoscyamia, and the anæsthetics properly so called, such as chloroform, ether, ethidene, etc. The hypnotics are such substances as opium and its alkaloids, chloral hydrate, hyoscyamus, lactucarium (obtained from *Lactuca virosa*, the strong-scented lettuce), and preparations of *Humulus Lupulus* (the common hop), such as inhalations of the steam of infusions, or hop-pillows. In addition we may group as narcotics certain substances which cause not only narcotism, but also the specific effect of dilatation of the pupil of the eye, and disorder of the mechanism of focusing the eye for various distances resulting in dimness and confusion of vision. Such are sometimes called mydriatics; they embrace belladonna, henbane, stramonium, cryptopia (one of the alkaloids in opium), and Indian hemp.

All of these substances act on the nervous system,

and, although the physiological action of each is characteristic, there are many symptoms common to the whole group; indeed the course of action of all shows three well-defined stages:—(1) there is first a period of apparent exaltation of function; (2) this is followed by a period of diminution and perversion of functional activity; (3) there is a time of loss of function, in which there is profound coma and paralysis. This is well illustrated by a description of the symptoms caused by opium. A small dose not infrequently acts as a stimulant; there is a sense of vigor, a capability of severe exertion, and an endurance of labor without fatigue. A larger dose often exerts a calming influence, with a dreamy state in which images and ideas pass rapidly before the mind without fatigue. This is succeeded by sleep which, according to the strength of the dose and the idiosyncrasy of the person, may be light and dreamy, or like natural profound sleep, or deep and heavy, passing into stupor or coma. From this a person may awaken with a feeling of depression, languor, or wretchedness, often associated with sickness, headache, and vomiting. If a person do not thus awaken, and the dose be large, there is the condition of deep coma. This condition is succeeded by one of even deeper prostration. The person cannot be aroused; the pupils may now become somewhat dilated, especially on the approach of death; the countenance has a deathlike aspect, and a bluish-white tint; the pulse quickens and becomes smaller, and more and more feeble; and the skin is covered with a cold, clammy sweat. The vital functions are reduced to the lowest ebb, and death then occurs from failure of respiration. Such a train of symptoms is called narcotism. These general symptoms are of course largely modified by the amount of the dose. If it be very large, the person may pass very quickly into the deeply comatose stage.

NARD. See SPIKENARD.

NARSES, an officer in the household of Justinian, who was charged with the reconquest and government of Italy, is one of the most important historical figures of the sixth century. He was a eunuch, but we are nowhere distinctly informed that he was of servile origin. A native of Persarmenia (that is to say, of that portion of Armenia which was allotted to Persia by the partition of 384), he may have been prepared and educated by his parents for service in an Oriental court. If the statement that he died at the age of ninety-five be correct, he was born about the year 478.

NARSINHPUR, a district in the chief-commissionership of the Central Provinces, India, forms a portion of the upper part of the Nerbudda valley. The population in 1880 was 365,173.

NARVAEZ, PAMFILO DE, Spanish adventurer, was an hidalgo of Castile, born at Valladolid about 1480. He was one of the subordinates of Velazquez in the reduction of Cuba, and, after having held various posts under his governorship, was put at the head of the force sent to the Aztec coast to compel Cortes to renounce his command; he was surprised and defeated, however, by his abler and more active compatriot at Cempoalla, and made prisoner with the loss of an eye (1520). After his return to Spain he obtained from Charles V. a grant of Florida as far as the River of Palms, and landed at Tampa Bay in 1528. Having built rude boats, he sailed hence for Mexico on September 22d, but the vessel which carried Narvaez was driven to sea in a storm and perished. His lieutenant, Cabeza de Vaca, with three others who ultimately reached land, made his way across Texas to the Gulf of California.

NARVAEZ, RAMON MARIA, Spanish soldier and statesman, was born at Loja, Granada, on August 4, 1800, entered the army at an early age, and saw active

service under Mina in Catalonia, in 1822. In 1823 the French invasion caused him to retire into private life, whence he reëmerged in 1832, speedily attaining the rank of colonel. He achieved great popularity by his victory over Gomez, the Carlist general, near Arcos, in November, 1836, and after clearing La Mancha of brigands by a vigorous policy of suppression in 1838 he was appointed captain-general of Old Castile, and commander-in-chief of the army of reserve. In 1840, for the part he had taken at Seville in the insurrection against Espartero, he was compelled to take refuge in France, where, in conjunction with Maria Christina, he planned the expedition of 1843 which led to the overthrow of his adversary. In 1844 he became prime minister, and was created field-marshal and duke of Valencia, but his policy was too reactionary to be tolerated long, and he was compelled to quit office in February, 1846. He now held the post of ambassador at Paris, until again called to preside over the council of ministers in 1847; but misunderstandings with Maria Christina led to his resignation in the following year. His ministry succeeded that of O'Donnell for a short time in 1856-57, and he again returned to power for a few months in 1864-65. He once more replaced O'Donnell in July, 1866, and was still in office when he died at Madrid on April 23, 1868.

NARWHAL, an animal of the order *Cetacea*, belonging to the genus *Monodon*, of which there is but one species known, *M. monoceros* of Linnaeus. It is included in the family *Delphinidae* or Dolphins, and closely resembles the *Beluga* or White Whale in all points of its structure except its dentition, which presents most anomalous characteristics. In a narwhal twelve feet long, from snout to end of tail, the exerted portion of the tusk may measure six or seven and occasionally eight feet in length. It projects horizontally forward from the head in the form of a cylindrical or slightly tapering, pointed tusk, composed of ivory, with a central cavity reaching almost to the apex, without enamel, and with the surface marked by spiral grooves and ridges, running in a sinistral direction. Occasionally both left and right tusks are developed, in which case the direction of the grooves is not reversed, but the same in both. No instance has ever been met with of the complete development of the right tusk associated with a rudimentary condition of the left. In very young animals several small additional teeth, irregular in number and position, are present, but these usually disappear soon after birth.

The narwhal is essentially an Arctic animal, frequenting the icy circumpolar seas, and but rarely seen south of 65° N. latitude. Like most other cetaceans it is gregarious in its habits, being usually met with in "schools" or herds of fifteen or twenty individuals. Its food appears to be various species of cephalopods, small fishes, and crustaceans. The purpose served in the animal's economy by the wonderfully developed asymmetrical tusk—or "horn," as it is commonly but erroneously called—is not known.

NASH, RICHARD, better known as "Beau Nash," was born at Swansea, October 18, 1674. Nash found it necessary to turn gamester. The pursuit of his calling led him, in 1704, to Bath, where he had the good fortune almost immediately to succeed Captain Webster as master of the ceremonies. His qualifications for such a position were unique, and under his conventional authority reforms were introduced which rapidly secured to Bath a leading position as a fashionable watering-place. He died in 1761.

NASH, THOMAS, poet, playwright, and pamphleteer, was one of the most notable literary celebrities in the brilliant last decade of the reign of Elizabeth. The exact years of his birth and death have not been ascer-

tained; but from the fact that he proceeded B.A. (St. John's, Cambridge) in 1585 it has been conjectured that he was born about 1564, and his death was lamented in an epigram by Fitzgeoffrey in 1601. He tells us himself that his birthplace was Lowestoft.

NASHUA, a city of Hillsborough county, N. H., on hilly ground at the confluence of the Merrimac and the Nashua, forty miles north-northwest of Boston. In 1803 the site was "a sandy plain covered with pine trees;" but after the formation of the Nashua Manufacturing Company in 1823 the village rapidly grew up, and in 1853 it was incorporated as a city. Its population increased from 10,543 in 1870 to 23,898 in 1900. The water-power of the Nashua river being rendered easily available by means of a canal three miles long and eight feet deep, constructed in 1825-26, a great variety of industrial establishments are situated in the city. Besides the sheetings, shirtings, prints, and flannels manufactured by the original Nashua company and its younger rivals, iron goods, locks, edge tools, bedsteads, carpets, shuttles, bobbins, shoes, cards, glazed paper, are all produced on a large scale.

NASHVILLE, the capital of Tennessee, and seat of justice of Davidson county, stands on the Cumberland river (spanned there by a suspension bridge and a truss railway bridge with a "draw" 200 feet long), 200 miles above its junction with the Ohio. Occupying a site of considerable irregularity, and dominated by the hill (558 feet above the sea) on which the capitol is built, Nashville on the whole presents a picturesque and attractive appearance. The capitol is an imposing stone edifice, erected in 1845 at a cost of nearly \$1,000,000, and surmounted by a central tower 206 feet in height. Other public buildings deserving mention are the courthouse (1857), the market-house and city hall (1855), the State penitentiary (1830), the State blind asylum (1850), the four universities, and two large female seminaries. Nashville University, incorporated as Davidson College in 1785, as Cumberland College in 1806, and under its present name in 1825, now embraces three distinct schools—Montgomery Bell Academy, Nashville Medical College, one of the largest in the Southern States, and the Normal College, established and endowed by the trustees of the Peabody Fund. Vanderbilt University was founded in 1872 by six conferences of the Methodist Episcopal Church, South, and in 1873 was named after Cornelius Vanderbilt of New York, who gave it \$1,000,000. His son has given it about \$250,000 additional. It has a fine group of buildings and seventy-five acres of land west of the city. In 1901 it had 100 instructors and 754 students. Fisk University, established in 1866 for the education of men of color, and widely known through the Jubilee Singers, had 30 teachers and 502 students in 1901. The Tennessee Central (Methodist) College, likewise dating from 1866, is intended for colored students, as is also the Roger Williams University (Baptist). The State library in the capitol had 37,000 volumes in 1892; and the Watkins Institute library occupies a building erected in 1882, at a cost of \$130,000. Being the natural center of a wide productive region, and well served by river and rail, Nashville has an extensive and rapidly growing trade, especially in cotton and tobacco. In 1900 there were 488 manufacturing establishments, with a capital of \$13,150,137, employing 9,435 hands, whose wages amounted to \$3,764,946. The value of the products for the year was \$18,367,323. The value of the flouring and grist mill products was \$3,907,017. The population was 80,865 in 1900.

The total receipts of the city treasury for the fiscal year ending October 1, 1899, were \$1,817,068, and the disbursements \$1,677,571. The bonded debt of the city

amounted to \$2,605,400. The total assets (public property) were \$3,206,309, and the liabilities \$2,727,871. The valuation of taxable property in 1899 was \$38,233,245, and the rate of tax fifteen mills on the dollar.

The enumeration of children of school age (six to twenty-one) was 17,895 in 1888, with an average attendance of 6,405 pupils in the public schools. There were 152 teachers employed, and the total expenditures were \$108,034. The total value of school property is \$394,000.

Settled in 1780, Nashville received incorporation as a town in 1784 and as a city in 1806. It was not till 1843 that it became the capital of the State, though, with the exception of the period from 1815 to 1826, the legislature had met there from 1812. In February, 1862, Nashville was evacuated by the Confederate General A. S. Johnston, and was held from that time by the Federal forces. The attempt made in December, 1864, by the Confederate General Hood to recover the now strongly-fortified town resulted in the "battle of Nashville," in which his army was completely routed by that of Gen. G. H. Thomas.

NÁSÍK, or NASSICK, a district in the Bombay presidency, India. The population in 1901 was 791,206.

NÁSICK, the chief town of the district (population 22,436), is situated on the Godávari, and is considered a place of great sanctity by Hindus, who make pilgrimages to its temples from all parts of India.

NASIR KHOSRAU. Abū Mu'in-ed-din Násir b. Khosrau, the first great didactic poet of Persia, was a descendant of the imám 'Alí Ridá, and was born, according to his own statement in one of his kasidas, 394 A.H. (1004 A.D.), at Kubádiyán, near Balkh, in Khorásán. The first forty-two years of his life are obscure; we learn from incidental remarks of his that he was a Sunnite, well versed in all the branches of natural science, in medicine, mathematics, astronomy, and astrology, in Greek philosophy, and the interpretation of the Koran; that he had a comprehensive knowledge of many other philosophic systems and religious creeds professed in the East; and that he was, withal, much addicted to worldly pleasures, especially to excessive wine drinking, the renunciation of which forms a prominent topic in his later odes. He had studied Arabic, Turkish, Greek, the vernacular languages of India and Sind, and, perhaps even Hebrew; he had visited Múltán and Lahore, and been—probably in an official capacity—an eyewitness of the splendid Ghaznavide court under Sultán Mahmúd, Firdousi's patron, and his son Mas'úd. Later on he had chosen Merv for his residence, and was the owner of a house and garden there. When he first steps into the full light of history, in 437 A.H. (1045 A.D.), we see him in the position of a financial secretary and revenue collector of the Seljúk sultan Toghrulbeg, or rather of his brother Jághirbeg, the emír of Khorásán, who had conquered Merv in 1037.

The Dáhistán fixes his flight from Korásán in 456 A.H. (1064 A.D.), but there is strong evidence in some of his kasidas that this event took place some four or five years before that date; and as his death occurred in 481 A.H. (1088 A.D.) he must have lived in his exile from twenty-five to thirty years. His "nom de plume" was "Hujjat."

NASMYTH, ALEXANDER, portrait and landscape painter, was born in Edinburgh on September 9, 1758. He studied at the Trustees' Academy under Runciman, and, at the age of sixteen, attracted the attention of Allan Ramsay, who took the youth with him to London, and employed him upon the subordinate portions of his works. Nasmyth returned to Edinburgh in 1778, and was soon largely patronized as a portrait painter. On his return he painted the excellent portrait of Burns,

now in the Scottish National Gallery, well known through Walker's engraving. In his later years he devoted himself mainly to landscape work, and did not disdain on occasion to set his hand to scene-painting for the theaters. He has been styled, not unjustly, the "father of Scottish landscape art." Nasmyth died in his native city, April 10, 1840. His youngest son, James, was the well-known inventor of the steam-hammer.

NASMYTH, PATRICK, the eldest son of Alexander Nasmyth, was born at Edinburgh on January 7, 1787. Having studied under his father, he went to London at the age of twenty, and soon attracted attention as a clever landscapist. He was a diligent student of the works of Claude and Richard Wilson, and of Ruysdael and Hobbema, upon whom his own practice was mainly founded. His most characteristic paintings are of English domestic scenery, full of quiet tone and color, and detailed and minute expression of foliage, and with considerable brilliancy of sky effect. They were executed with his left hand, his right having in early life been injured by an accident. He died at Lambeth, August 17, 1831.

NASSAU, now forming the bulk of the government district of Wiesbaden, in the Prussian province of Hesse-Nassau, was till 1866 an independent and sovereign duchy of Germany, consisting of a compact mass of territory, 6,060 square miles in area, bounded on the south and west by the Main and Rhine, on the north by Westphalia, and on the east by Hesse. This territory is divided into two nearly equal parts by the river Lahn, which flows from east to west into the Rhine. The southern half is almost entirely occupied by the Taunus Mountains, which attain a height of 2,900 feet in the Great Feldberg, while to the north of the Lahn is the barren Westerwald, culminating in the Salzburgerkopf (2,000 feet). The valleys and low-lying districts, especially the Rheingau, are very fertile, producing abundance of grain, flax, hemp, and fruit; but by far the most valuable product of the soil is its wine, which includes several of the choicest Rhenish varieties, (Johannisberger, Marcobrunner, Assmannshauser, etc.) Nassau is one of the most thickly wooded regions in Germany, about 42 per cent. of its surface being occupied by forests, which yield good timber and harbor large quantities of game. The rivers abound in fish—the salmon fisheries on the Rhine being especially important. There are upward of 100 mineral springs in the district, most of which formerly belonged to the duke, and afforded him part of his revenue. The best-known are those of Wiesbaden, Ems, Soden, Schwalbach, Schlangenbad, Geilnau, and Fachingen. The other mineral wealth of Nassau includes iron, lead, copper, building-stone, coals, slate, a little silver, and a bed of malachite. There are few places of importance besides the above-named spas; Höchst is the only manufacturing town. Wiesbaden, with 86,086 inhabitants, is the capital of the government district as it was of the duchy. Hesse-Nassau in 1900 had 1,897,981 inhabitants, of whom 1,224,021 are Protestants, 482,752 Roman Catholics, and 45,725 Jews. The ecclesiastical jurisdiction is in the hands of the Protestant bishop of Wiesbaden and the Roman Catholic bishop of Limburg. Education is amply provided for in numerous higher and lower schools. The annual revenue of the dukedom is about 4,000,000 gulden (\$2,000,000). It furnishes a contingent of 6,000 men to the army of the German Confederation.

NASSAU, the capital of New Providence, and seat of government of the Bahama Islands. At one time the town was noted as a great rendezvous for pirates. Its harbor, admitting vessels drawing twelve feet, acquired much importance during the blockade of the southern ports in the American War. The popu-

lation of Nassau, principally colored people, is about 8,000, out of the island population (1900) of 12,534.

NASTURTIUM. The common water-cress (*N. officinale*), so largely used as a salad, may be taken as a representative of this genus *Crucifera*—a genus characterized, for the most part, by pinnately divided foliage, white or yellow cruciform flowers, and long pods with a double row of seeds. The embryo root is folded up along the edge of the cotyledons accumbent. Its flavor is due to an essential oil containing sulphur, its antiscorbutic properties to the presence of iodine, iron, and phosphates.

NATAL, a British colony on the southeast coast of Africa, is bounded on the northeast by Zululand and the Transvaal, on the southeast by the Indian Ocean, on the northwest by the Orange Free State and the Transvaal, and on the southwest by Basutoland, Griqualand East, and the country of the Pondas. It is of an irregular diamond shape, with a length of about 270 miles from north to south, and a breadth of 170 miles from east to west. The extent of seacoast is about 150 miles, and its area is about 29,200 square miles, or 11,000,000 acres (one-third of the size of England). Rich in verdure, and in the wet season clothed with bright green grass and clumps of trees and bushes, and diversified by numerous streams, the landscape indicates a country of great fertility of soil. From the coast to the western boundary of the colony the land rises by terraces or plateaus to an elevation of at least 4,000 feet above the sea-level. For about fifteen miles inland it is broken and hilly, and thickly covered with long grass, and in some parts studded with jungly bush and clumps of palm, euphorbia, and mimosa. For some thirty miles further inland the more elevated but less broken land loses all tropical character, and presents large tracts of good pasturage, but with scarcely any bush or wood. Beyond this district, at an ever-increasing elevation, the country, still hilly and undulating, opens out in many places into more extensive grass plains.

The colony is well watered throughout, but none of the streams are navigable, and all have bars at their entrances. The harbor or port of Natal at Durban (strictly D'Urban), the only natural one in the colony, consists of an outer bay or roadstead, which has a fair anchorage, and an inner bay; at the entrance of the latter is a deepwater channel, where ships of large tonnage can be safely moored, but a sand bar at its entrance restricts the passage of large ships to the highest tides, and in rough weather renders communication with the outer bay quite impracticable.

The summer or hot rainy season lasts from October to March inclusive, and the six remaining months form the winter or cold dry season. In the summer months cloudy afternoons with thunder-storms are frequent, and the accompanying rains are very cool and refreshing. Within thirty miles of the coast fires in dwellings are seldom required throughout the coldest months of the year. The rainfall averages 33.50 inches; it is heaviest in the summer months, but in June and July it frequently happens that there is no rain at all over a large portion of the colony.

Coal of several qualities exists in the Klip River county, with seams varying from four to ten feet in thickness; analysis and experiment have shown it to be very suitable for locomotive and general steam purposes. Some descriptions of it are well suited for gas, and nearly all of it will make good household coal. The area of the available coal-field is some 1,350 square miles, and at a moderate computation the mines contain 2,000,000,000 tons of serviceable coal. In association with these seams of coal very valuable iron ore has been discovered.

The chief forms of plants peculiar to Natal are the liane and mimosa along the coast, and the orchid, aloe, pothos, liliaceous, and fern forms in the upland districts. The heaths and proteads common at the Cape of Good Hope are seldom if ever found in Natal, but almost any varieties of the flora of semi-tropical and temperate countries that are introduced attain perfection. The indigenous timber-trees, mostly found in isolated clumps and in somewhat inaccessible situations, are principally the yellow wood (*Podocarpus elongatus*), sneezewood (*Pteroxylon utile*), stinkwood (*Oreodaphne bullata*), black ironwood (*Olea laurifolia*), white ironwood (*Vepris lanceolata*), and the mangrove (*Rhizophora*); all are very useful woods, and the yellow wood, sneezewood, stinkwood, and ironwood when polished have grain and color equal to maple, walnut, and ebony.

The herds of elephants which roamed in the coast bushes in 1837 have disappeared, and the roar of the lion is no longer to be heard in the uplands. The hippopotamus is very scarce, and nearly all, if not all, the buffalo and quagga have crossed over into Zululand. Leopards or tigers and tiger cats (all called by the natives "ingwe"), and hyenas and wild dogs (*Canis pictus*) of different species, are still found in or about bush jungles and forest clumps; elands (*Antilope oreas*) are preserved on some estates, and there are at least ten distinct species of antelope. Ant-eaters (*Orycteropus capensis*), porcupines, rock rabbits, hares, and cane rats are common in different localities. Baboons (*Cynocephalus porcarinus*) and monkeys of different kinds frequent the mountains and rocky kloofs and bush and timber lands. The birds of Natal are of many species; some have beautiful plumage, but none of them, with the exception of the canary, are to be considered as songsters. The crocodile is to be found at the mouths of all rivers, and for a certain distance inland from the sea. Of snakes there are about forty distinct species or varieties. The most dreaded by the natives are called "imamba," of which there are at least eight different kinds; these snakes elevate and throw themselves forward, and have been known to pursue a horseman. Fish of excellent quality and in great quantities abound on the coast. Prawns, crayfish, and oysters are also obtainable, and turtle are frequently captured.

The chief crop is maize, known in South Africa as "mealies," its grain constituting the principal food of about seven-eighths of the population. Maize, indeed, and Kaffre corn, with pumpkins and sweet potatoes, "imhee" or "imfi" (*Sorghum saccharatum*), and tobacco are about the only crops raised by the natives. The European farmers in the uplands, by irrigating the land in the winter months, produce wheat of very fair quality, but not in sufficient quantity to supply the demands of the colony. Oats, barley, and other grains grow readily; and nearly all European vegetables yield fair crops in suitable localities.

The staple productions of Natal have increased with the introduction of the sugar-cane, and sugar and rum are the principal articles of native produce exported. Wool, arrowroot, and feathers are also the outcome of local industry, but the exports of greatest value and importance are the wool and hides of the Transvaal and the Orange Free State, and feathers, ivory, and skins from the interior, which are shipped at Durban.

Until very recently all goods and produce were conveyed in ox-wagons carrying from three to five tons weight. These had to travel on roads sometimes little better than tracks worn by traffic, and frequently impassable during wet weather, and for some years before the breaking out of the Zulu War (1879) the average cost of carriage was as high as 36 cents per ton per mile. Now, however, three lines of railway have

been opened—one of seventy-eight miles from the port at Durban to Pietermaritzburg, another from Durban twenty miles north to Verulam through the sugar lands in that district, and a third seven miles southward to the sugar estates by the Isipingo river. An additional line, of 118 miles, costing about \$5,590,000, has been constructed from Pietermaritzburg to Ladysmith. The telegraph between Natal and the Cape Colony was opened in 1878, and in the following year telegraphic communication by way of Lorenzo Marques was extended to England. Branches of telegraph are also carried direct from Natal into the Transvaal and the Orange Free State.

The colony was annexed as a district to the Cape Colony in August, 1845, but in November of the same year it was made a separate government, to be administered by a lieutenant-governor under the general control of the governor of the Cape Colony. The colony is now administered by a governor, the promotion from lieutenant-governor having been made January 28, 1882; and by law No. 1, 1883, the legislative council consists of thirty members, twenty-three of whom are elective and seven non-elective, two of the latter holding office during the royal pleasure.

The total population in 1900 was 929,970, of whom about 65,000 are whites, 70,000 Indian coolies, and 800,000 natives, mostly descendants of early refugees from Zululand.

NATAL, a city of Brazil, the capital of the province of Rio Grande do Norte, is situated on the eastern bank of the river of that name. Though the water on the bar is only fourteen feet at low tide, Natal is the first port of any note to the south of Cape Roque, and trades in cotton, sugar, dyewood, and other local produce. It was founded in 1597. The population is about 11,000.

NATCHEZ, a city and port of entry of the United States, capital of Adams county, Miss., lies on the east bank of the Mississippi, 272 miles above New Orleans. Natchez-under-the-Hill, lying on a low alluvial bank, contains the steamboat landing and a few business houses. The main city, Natchez-on-the-Hill, occupies the summit of a bluff which rises nearly 200 feet above the river, and affords a wide view over the cotton plantations of Louisiana. Among the more conspicuous buildings are the city hall, the court-house, the market-house, the Roman Catholic cathedral, the Jewish synagogue, and a number of handsome churches. There are two large cotton factories and other manufacturing establishments. Cotton dealing is the staple trade. The inhabitants numbered 4,454 in 1850, 6,612 in 1860, 9,057 in 1870, and 12,210 in 1900—the city being in population the third in the State.

NATHANAEL ("he whom God gave," equivalent to Nathanah or the Greek Theodore), a common name in later Old Testament times.

NATICK, a town of the United States, in Middlesex county, Mass., near the left bank of the Charles River, a few miles to the southeast of Cochituate Lake, and about eighteen miles west-southwest of Boston by the railway between that city and Worcester. It is mainly engaged in the manufacture of boots and shoes, but also produces clothing, boxes, and carriages. The population in 1900 was 9,488.

Natick ("our land") was in 1650 granted to John Eliot, the Indian "Apostle," for the occupancy of Indians converted to Christianity; and until 1721 the community was governed by a constitution modeled on that of Exodus xviii. Portions of the records, written in the Indian language, are extant. The site of the first Indian church is now occupied by the Unitarian church. Of the Natick Indians only four or five remain, all of

mixed blood. The incorporation of the town date from 1781.

NATIONAL DEBT. National debt is so universal an institution that it has been described as the first stage of a nation toward civilization. A nation, so far as its finances are concerned, may be regarded as a corporate body or even as an individual. Like the one or the other it may borrow money at rates of interest, and with securities, general or special, proportionate to its resources, credit, and stability. But, while in this respect there are certain points of analogy between a state and an individual, there are important points of difference so far as the question of debt is concerned. A state, for example, may be regarded as imperishable, and its debt as a permanent institution which it is not bound to liquidate at any definite period, the interest, unless specially stipulated, being thus of the nature of transferable permanent annuities. While an individual who borrows engages to pay interest to the lender personally, and to reimburse the entire debt within a certain date, a state may have an entirely different set of creditors every six months, and may make no stipulation whatever with regard to the principal. A state, moreover, is the sole judge of its own solvency, and is not only at liberty either to repudiate its debts or compound with its creditors, but even when perfectly solvent may materially alter the conditions on which it originally borrowed. These distinctions explain many of the peculiarities of national debts as contrasted with those of individuals—though a nation, like an individual, may by reckless bad faith utterly destroy its credit and exhaust its borrowing powers.

A well-organized state ought to have within itself the means of meeting all its ordinary expenses; where this is not the case, either through insufficiency of resources or maladministration, and where borrowing is resorted to for what may be regarded as current expenses, a state imperils, not only its credit, but, when any crisis occurs, its very existence; in illustration of this we need only refer to the cases of Turkey in Europe and some of the states of Central and South America. Even for meeting emergencies it is not always inevitable that a state should incur debt; its ordinary resources, from taxation or from state property, may so exceed its ordinary expenses as to enable it to accumulate a fund for extraordinary contingencies. This, it would seem, was a method commonly adopted in ancient states. The Athenians, for example, amassed 10,000 talents in the interval between the Persian and the Peloponnesian wars, and the Lacedæmonians are said to have done the same. In the early days of Rome the revenue from certain sources was accumulated as a sacred treasure in the temple of Saturn; and we know that when Pompey left Italy he made the mistake of leaving behind him the public treasury, which fell into the hands of Cæsar. In later times, also, the more prudent emperors were in the habit of amassing a hoard. This system has long prevailed in Prussia, and even at the present day exists to some extent in reconstituted Germany. In our own time, of the five milliard francs of indemnity paid by France as a result of the Franco-German war, 150,000,000 were set apart to reconstitute the traditional war-treasury. The German empire, apart from the individual states which comprise it, had, in 1882, a debt of about \$120,000,000, while its invested funds amounted to \$185,000,000, including a war-treasure of \$30,000,000.

All modern states, it may be said, have been compelled to have recourse to loans, either to meet war expenses, to carry out great public undertakings, or to make up the recurrent deficits of a mismanaged revenue. Resources obtained in this way are what constitute national debt proper. Loans have been divided into

forced and voluntary. Forced loans can, of course, only be raised within the bounds of the borrowing country; and, apart from the injustice which is sure to attend such an impost, it is always economically mischievous. The loans which the kings of England were wont to exact from the Jews were really of the character of forced loans, though the method has never been used in England in modern times so extensively as on the Continent. There the sum sought to be obtained in this way has never been anything like realized. In 1793, for example, a loan of this class was imposed in France, on the basis of income; and of the milliard (francs), which it was sought to raise, only 100,000,000 were realized. In Austria and Spain, also, recourse has been had at various times to forced loans, but invariably with unsatisfactory results. Other methods of a more or less compulsory character have been and are made use of in various states for obtaining money, which, as they involve the payment of interest, may be regarded as of the nature of loans; but the debt incurred by such methods is comparatively insignificant, and some of the methods adopted are peculiarly irritating and mischievous. On the other hand, it has occasionally been attempted to raise voluntary loans by appeals to a nation's patriotism; the method has been confined almost exclusively to France. After the revolutions of 1830 and 1848 appeals were thus made to the patriotism of French capitalists to buy 5 per cents. direct from the government at par, at a time when the French 5 per cents. were selling at 80; but the results were quite insignificant. Even if the amount sought for by a government could be obtained on the voluntary principle, the method itself is vicious, withdrawing as it does from the general working capital of the country a sum of serious dimensions. In short, the only economically sound method of meeting expenses which the ordinary resources of a state cannot meet is by borrowing in the open market on the most advantageous terms obtainable.

There are two principal methods of issuing or effecting a loan. Either the state may appeal directly to capitalists and invite subscriptions, or it may delegate the negotiation to one or more bankers. The former method has been occasionally followed in France and Russia, but in practice it has been found to be attended with so many disadvantages to the borrowing state or city that the best financial authorities consider it unsound. The great banking-houses have such a command over the money-market that it is difficult to keep even a direct loan out of their hands. The majority of loans, therefore, are negotiated by one or more of these houses, and the name of Rothschild is familiar to everyone in connection with such transactions. By this method a borrowing state can assure itself of having the proceeds of the loan with the least possible delay and with the minimum of trouble. A loan may be issued at, above, or below par, though generally it is either at or below par—"par" being the normal or theoretical price of a single share in the loan, the sum which the borrowing government undertakes to pay back for each share on reimbursement, without discount or premium. Very generally, as an inducement to investors, a loan is offered at a greater or less discount, according to the credit of the borrowing government.

If a state, for example, borrows at par at 6 per cent. when its credit is low, it may easily when again in a flourishing condition reduce the interest on its debt to 4 or even 3 per cent. The United States Government has actually done so with the debt it had to contract at the time of the civil war. This method of reducing the burden of a debt is evidently no injustice to the creditors of a government, when used in a legitimate way. A

state is at liberty at any time to pay off its debts, and, if it can borrow at 3 per cent. to pay off a 6 per cent. debt, it may with perfect justice offer its creditors the option of payment of the principal or of holding it at a reduced interest. Government debts are, however, sometimes reduced after a fashion by no means so legitimate as this; we need only refer to Turkey, where both principal and interest have been enormously reduced on a debt on which little or no interest was ever paid. Other states have been even more unprincipled, and have got rid of their debts at one sweep by the simple method of repudiation. (See NATIONAL DEBTS in Supplements.)

The debt of the United Kingdom at the Revolution in 1688 amounted to only \$3,300,000, with an annual charge of \$195,000. During the reign of William III. this increased to the comparatively large sum of \$63,500,000, with an annual charge of \$6,050,000, which at the accession of George I. had grown to \$180,000,000 and \$15,300,000 respectively. In 1727 the capital had increased to \$269,500,000, while by reduction of interest the annual charge had diminished to \$11,800,000. Partly by the operation of the sinking fund, the debt in 1739 had decreased by upwards of \$35,000,000, but the wars which followed left it at the treaty of Aix-la-Chapelle in 1748 at the sum of \$387,000,000. By the end of the Seven Years' War, however, in 1763, the debt had risen to \$666,000,000, besides terminable annuities, and the annual charge to \$25,000,000. At the commencement of the American War, 1775, the debt had fallen to \$630,000,000, but as a result of that war this was more than doubled, and the burden had grown to \$1,350,000,000, including the capitalized value of terminable annuities. After a diminution of about \$50,000,000 during the nine years' peace, the long French wars, which terminated in 1815, left the country burdened with a debt of over \$4,500,000,000, at an annual charge of \$160,000,000. With various fluctuations during the next forty years, the debt gradually diminished to about \$4,000,000,000. The two years of war with Russia cost upward of \$150,000,000, and in 1857 the capital sum had risen to \$4,100,000,000 and the annual charge to \$140,000,000. In 1870 it had fallen again to \$4,000,000,000, which in 1883 had diminished to \$3,750,000,000, with an annual charge of \$145,000,000, including terminable annuities and the charge thereon, as well as the sinking fund. The actual capital of the British debt does not represent by any means the sums really received by the state. During the past and the early years of the present century enormous sums were borrowed at a price far below par, the difference adding many millions to the actual burden of the debt. On April 5, 1900, the English national debt was \$3,528,619,390, and the annual charge was \$130,000,000.

One peculiarity of the national debt of France is that it is reckoned, not according to capital, but according to rente or interest; so that any estimates based on rente must be regarded as approximate. Another peculiarity is the minute distribution of the consolidated debt among a multitude of creditors, most of whom are French; this arises from the fact that the shares in French debt may be subdivided into minute parts, and an investor may thus purchase a few francs' worth of rente. Thus in 1883 the number of holders of rente was over 4,000,000. The debt of France can be traced as far back as 1375, and at the death of Louis XIV. in 1715 it is estimated to have amounted to a capital of \$600,000,000, though this was arbitrarily reduced in the following year to \$400,000,000. The republican government of 1793 canceled nearly the whole of the then existing debt, reducing it to a capital of \$160,000,000, with a rente of £8,000,000. During this empire, notwithstanding Napoleon's extensive wars, the debt had only grown to 350,000,000, including a floating

debt of \$100,000,000. Under the Bourbons, what with war-leaves and constant deficits, it grew rapidly, and in 1830 stood at \$700,000,000. To this the Orleans dynasty added \$200,000,000, leaving the debt in 1848 at \$900,000,000. During the four years of the republic this grew to \$1,200,000,000, while the enormous deficits and the wars of the second empire raised it to \$2,700,000,000 in December, 1870. The further cost of the German war, with its enormous indemnity and the foreign occupation of 1870-73, added upward of \$1,500,000,000 to this. Since then the French debt has steadily grown, and in 1900 stood (capitalizing all classes of debt) at about \$6,019,326,500, with an annual charge of \$250,000,000—the largest in the world.

In 1763, at the end of the Seven Years' War, Austria had a debt of only \$73,000,000; but, as it is a country of almost constant deficits, this sum has rapidly increased. In 1815 it was \$400,000,000; in 1830, \$525,000,000; in 1848, \$600,000,000; in 1862, after the French war, \$1,300,000,000, to which the war with Prussia added \$200,000,000 in 1866. Since then it has grown apace, and in 1889 stood at \$2,000,000,000, including floating debt, paper-money, and Austria's special liabilities, but excluding the special debt of Hungary, which amounted to over \$600,000,000; Hungary, besides, contributes three-tenths to the interest of the common debt, this interest amounting to \$60,000,000, in addition to over \$10,000,000 for Austria's special debt.

The debt of Prussia in 1800 was only \$26,000,000, which as a result of the French wars grew by 1820 to \$150,000,000. By 1842 \$50,000,000 were paid off, but in 1866 it had risen to \$210,000,000, partly from deficits, partly from war preparations, and partly from money sunk in the construction of railways. The war with Austria, and the annexations in 1866, raised it by 1870 to \$280,000,000. Since then it has nearly doubled, and in 1899 had reached the sum of \$1,650,700,614. Much of the debt of Prussia has, however, been contracted for railways and the development of the resources of the country, and is in fact nearly covered by the revenue of the state railways, domains, and mines. The German empire, as such, had no debt at the time of its reestablishment in 1870, though one has since been created. Besides Prussia, each of the German states has its own special debt. In all these amounted to about \$850,000,000, most of this sum having been borrowed for the construction of railways, so that the actual burden is comparatively small. Thus the total debt of the empire and of the states composing it is over \$2,000,000,000.

It is difficult to obtain any trustworthy figures as to the debt of Russia. The history of its finances is a history of almost continual deficits, largely covered since the time of Catherine II. by the issue of paper rubles, which at her death amounted to about \$150,000,000, and in 1817 to \$620,000,000. The total debt was first stated for 1853, when it was given as \$620,000,000, including paper money. In 1858, after the Crimean War, it was \$1,200,000,000, and in 1869, including the floating debt, \$1,800,000,000. In 1899 it was estimated at \$2,282,000,000, one-third of which was paper rubles. Were the depreciated ruble taken at par, the sum would be nearly half as much again. The interest on the debt in 1889 amounted to \$210,000,000.

In 1876 the debt of Turkey stood at \$1,450,000,000, but since then, by a process of reduction, it has been brought down to \$900,000,000, besides an internal debt estimated at \$100,000,000.

The united kingdom of Italy began in 1860 with a debt of \$480,000,000, which, mainly through continual deficits, but partly by the construction of railways, had grown to \$2,665,024,950 in 1900.

Like Austria, Spain has been a country of constant deficits, combined with frequent repudiations and chronic inability to meet the claims of creditors. Spain was deeply in debt so long ago as the sixteenth century; the amount in 1745 was \$45,000,000, which was repudiated by Ferdinand VI. A commission in 1822 reported the debt at \$700,000,000, but in 1822 a second junta reduced it to \$250,000,000. In 1851, with the floating debt, the amount was \$550,000,000, one half of which was declared passive, bearing no interest. In twenty years this had more than doubled, being in 1870 \$1,150,000,000, with an annual charge of \$33,000,000. In 1887 the capital sum had increased to \$2,500,000,000, but by a process of conversion this was reduced to \$2,485,000,000.

Portugal has for its size a large debt, the result also of a vicious financial administration. It began in 1796 with \$4,500,000, which in 1854 rose to \$100,000,000, in 1866 to \$215,000,000, in 1871 to \$320,000,000, and in 1900 to \$915,308,742.

Greece began her independence by becoming a debtor in 1824 for \$4,000,000, and her borrowings since have loaded the little kingdom with a debt of \$173,000,000, the interest on which has never been regularly and fully paid. Part of the debt is guaranteed by England, France, and Russia.

The debt of Holland began in the sixteenth and seventeenth centuries in her struggle with Spain and wars with England, and in 1778 the Dutch were oppressed with a debt of \$300,000,000, which by 1814 had risen to \$700,000,000, the annual charge per head of population being over \$8. By 1851 the capital was reduced to \$500,000,000, which has gone on steadily decreasing, and in 1899 the capital sum was \$462,000,000.

The debt of Belgium began with \$50,000,000 taken over from Holland after 1830, which, after growing to \$190,000,000, and again falling by the operation of the sinking fund to \$120,000,000 in 1865, has since steadily grown to about \$440,000,000 in 1889, including the railway purchase, the annuities granted for which represent about \$65,000,000. Most of the remainder of the debt is covered by the proceeds of the various public works for which it has been raised.

The debt of Denmark was \$20,000,000 in 1821. Partly through deficits, partly through war with Prussia, and partly owing to the construction of state railways, this grew to \$73,000,000 in 1865. This declined to \$47,000,000 in 1880, but subsequent loans raised it to over \$58,000,000 in 1899.

The existing debt of Sweden began with a railway loan of \$6,000,000 in 1853, and nearly all her subsequent loans have been contracted for similar purposes, the total debt in 1899 being \$87,000,000.

The United States began its career as a federal republic with a debt of \$75,000,000 (1791), on which there was little increase till 1816, when it reached \$125,000,000, which in 1835 was almost extinguished. The debt, however, rose again, but never exceeded \$70,000,000 till 1860, the year before the civil war, when it reached \$90,000,000. During the next four years the debt rose rapidly, and after the conclusion of the war in 1865 the country was saddled with a debt of \$2,700,000,000. This has gone on decreasing since with wonderful rapidity, on account of the systematic application of the large surplus revenue to its reduction, and in November, 1900, the total indebtedness was \$2,136,961,092.

NATIVE AMERICANS. Between the years 1840 and 1845 a party known as the "Native Americans" came into some notoriety in the Eastern States, and in 1844 elected James Harper as mayor of New York city. This success, however, was not so much owing to the anti-alien element in the party as to the personal popularity of the nominee. The party languished for ten years, but

in 1855 another Native American organization rose in the field of politics. The American party was organized as a secret order, and its members when questioned about it invariably replied that they "knew nothing." From this the party became known as the "Know Nothing" party. It had made great headway almost before its existence was more than suspected, and in 1855 elected governors and legislatures in five Northern States and in Kentucky and Florida, and had shown strength in other States. In 1856 a national campaign was inaugurated with Millard Fillmore for the standard-bearer. The platform called for the election to office of none but native-born citizens, specially proscribed Roman Catholics (as acknowledging allegiance to a foreign prince), and demanded that the period of probation for foreign-born denizens seeking naturalization should be extended to twenty-one years. The Know Nothing candidate received the eight electoral votes of Maryland in 1856, but was swallowed up by the rise of the great Republican party.

NATOLIA, or **ANATOLIA**. See **ASIA MINOR**.

NATRON. See **SODA**.

NATURALIZATION. See **ALIEN**.

NAUDE, **GABRIEL**, French librarian and scholar, was born at Paris in February, 1600, and died in 1653.

NAUGATUCK, a post village of New Haven county, Conn., fifteen miles from New Haven, is a growing manufacturing place with a population of 10,541 in 1900.

NAUMACHIA, the Greek word denoting a naval battle, was used by the Romans as the name for mimic sea-fights which were shown as a spectacle to the public.

NAUMBURG, the chief town of a circle in the district of Merseburg, Prussian Saxony, and the seat of the provincial law courts, is situated on the Saale, near its junction with the Unstrut, in the center of an amphitheater of vine-clad hills. There are three Protestant churches, a Roman Catholic church, a gymnasium, a realschool, an orphanage, and two or three hospitals. The town-hall was originally the residence of the bishop. The inhabitants, who number 17,868, are chiefly employed in producing wine, but also manufacture cotton and woolen fabrics, chemicals, combs, and leather.

NAUPACTUS. See **LEPANTO**.

NAUPLIA, a town in the Peloponnesus, at the head of the Argolic Gulf. In the classical period it was a place of no importance, and when Pausanias lived, about 150 A.D., it was deserted. At a very early time, however, it seems to have been of greater note, being the seaport of the plain in which Argos and Mycenae are situated. A hero Nauplius took part in the Argonautic expedition; another was king of Euboea. Population, 5,000.

NAUTILUS. A cuttle fish, known as the "Portuguese man-of-war."

NAVAL ACADEMY. The Naval Academy of the United States at Annapolis, Md., was founded in 1845 for the education of officers of the navy, in the same manner as the Academy at West Point educates officers for the army. During the Civil War the Academy was temporarily removed to Newport, R. I., and in 1867 it was again opened at Annapolis. Nominations to the Naval Academy are made upon the recommendation of congressmen, and the president selects ten at large. All candidates must be between fourteen and eighteen years of age, physically sound and of robust constitution, and must pass an examination according to the regulations prescribed by the secretary of the navy. Successful candidates sign articles binding themselves to serve in the United States navy for eight years (including the five years probation in the Naval Academy), and each receives an

allowance of \$500 a year while a naval cadet. A line officer of rank not below that of captain is assigned as superintendent of the Academy, which is governed by a board composed of the superintendent, the commandant of cadets, and the heads of departments. The cadets are divided into four classes, corresponding to the years of instruction, and they are subject to strict rule and discipline. Practical instruction in drill, astronomy, gunnery, navigation and other branches is given, and practice cruises are had each year.

NAVARINO, or **NEOCASTRO**, a seaport of the Morea, Greece, in the monarchy of Messenia, stands on the south shore of the Bay of Navarino. It consists of a citadel, situated on a high rock, and a lower town—the whole being surrounded by a wall. The population is under 2,000.

The word Navarino is explained as equivalent to Avarino, and is said to record an Avar settlement made here in the sixth century. The name Neocastro distinguishes the place from Paleocastro, the alleged site of the ancient Pylus, on the northern shore of the bay. Sphacteria was the scene of the famous blockade and defeat of the Spartans in 425 B.C.; and it was by the victory of the combined fleets of Great Britain, France, and Russia over those of Turkey and Egypt in the Bay of Navarino on October 27, 1827, that the independence of Greece was virtually secured.

NAVARRA, an inland province of northern Spain, its greatest length from north to south being ninety miles, its breadth from east to west eighty-six miles, and its area 4,046 square miles. The population is 302,978. It is bounded on the north by France (Basses Pyrénées), on the east by Huesca and Zaragoza, on the south by Zaragoza and Logroño, and on the west by Alava and Guipuzcoa. It is traversed from east to west by the Pyrenees and by the Cantabrian mountains, their continuation in the west, which on the northeast especially presents an almost impassable barrier, and incloses numberless secluded pastoral valleys. From Navarra there are only three practicable roads for carriages into France—those by the Puerta de Vera, the Puerta de Maya, and Roncesvalles. The chief river flowing toward the Atlantic is the Bidasoa, which rises near the Puerta de Maya, and after flowing southward through the valley of Baztan takes a northeasterly course; by far the larger portion of the province has its drainage to the Mediterranean through the Ebro, whose main feeders there are the Ega and the Aragon with its tributary the Arga. The hilly districts are almost entirely appropriated to forests and pasture, the most common trees being the pine, beech, oak, and chestnut. Much of the lower part of the province is well adapted for agriculture, producing the various cereals in remunerative abundance; the principal fruit grown is the apple, from which cider is made in some districts; hemp, flax, and oil also occur, and the cultivation of the mulberry for the silk-worm is not unknown. Game, both large and small, is abundant in the mountains, not even the bear being wholly extinct; and the streams abound with trout and other fish. The capital is Pamplona, with a population of 25,630. It is connected by rail on the west with Alsasua on the trunk line between Madrid and San Sebastian, and with the Ebro valley in the south. There are no other railways in the province. Besides Pamplona, the only ayuntamiento with a population exceeding 10,000 is Tudela (10,086); Baztan comes next with 9,931.

NAVARRETE, **JUAN FERNANDEZ**, surnamed El Mudo (The Mute), an eminent Spanish painter of the Madrid School; was born at Logroño in 1526. He received his first instructions in art from Fray Vicente de Santo Domingo, a Hieronymite monk at Estella, and

afterward he visited Naples, Rome, Florence, and Milan. According to the ordinary account he was for a considerable time the pupil of Titian at Venice. In 1568 Philip II. summoned him to Madrid with the title of king's painter and a salary, and employed him to execute pictures for the Escorial. The most celebrated of the works he there produced are a *Nativity*, a *Baptism of Christ* (now in the Madrid Picture Gallery), and *Abraham Receiving the Three Angels* (one of his last performances, dated 1576). He died at Toledo in February, 1579.

NAVARRETE, MARTIN FERNANDEZ DE, Spanish historian, was born at Abalos, Logroño, in 1765, received his early education at the seminary in Vergara, Guipuzcoa, and entered the navy as a midshipman in 1780. His ship was engaged in the unsuccessful operations against Gibraltar in 1782, and afterward in the suppression of Algerine pirates. Rejoining the navy in 1793, he was present at the siege of Toulon, and afterward received command of a frigate. From 1797 to 1808 he held in succession various important posts in the office of the minister of marine. In 1808 the French invasion led to his withdrawal to Andalusia, and the rest of his life was entirely devoted to literature. At the time of his death, which occurred on October 8, 1844, he was assisting in the preparation of the *Colección de Documentos Inéditos para la Historia de España*.

NAVIGATION is the art of conducting a ship across the ocean. It is here treated to the exclusion of seamanship, which forms a distinct subject.

Up to the time of the Portuguese exploring expeditions, sent out by Prince Henry, which led to the discovery of the Azores in 1419, and the rediscovery of the Cape Verd Islands in 1447, and of Sierra Leone in 1460, navigation had been conducted in the most rude, uncertain, and dangerous manner it is possible to conceive. Thousands of years had passed without the least improvement being introduced, except the magnetic needle about the beginning of the fourteenth century (see COMPASS and MAGNETISM). Prince Henry did all in his power to bring together and systematize the knowledge then obtainable upon nautical affairs; he also established an observatory at Sagres (near Cape St. Vincent) in order to obtain more accurate tables of the declination of the sun.

The backward state of navigation at this time is best understood from a sketch of the few rude appliances which the mariner had. He had a compass, a cross-staff or astrolabe, a moderately good table of the sun's declination, a correction for the altitude of the pole star, and occasionally a very incorrect chart. The first map or sea chart seen in England was brought by Bartholomew Columbus in 1489, and the first map of England was made in 1520. Decimal arithmetic was invented by Simon Stevin about the end of the sixteenth century. Watches were unknown till 1530, and immediately Gemma Frisius or Frisius seized the idea for the purpose of ascertaining the difference of longitude between two places. They were too rough to be of use, and their advocate proposed to correct them by water-clocks or sand-clocks. Almanacs were first published in Poland in 1470, and in London three years later. These contained tables of the sun's declination and that of many of the stars, and tables for finding the latitude by the pole star and the "pointers." There was not till 1607 any means whatever of measuring a ship's progress through the water, and none in general use till twenty or thirty years later (see LOG).

The "cross-staff" appears to have been used by astronomers at a very early period for measuring heights and distances, more recently by seamen for

measuring altitudes. It was one of the few instruments possessed by Columbus and Vasco da Gama. Another primitive instrument in common use at the beginning of the sixteenth century was the astrolabe, which was more convenient than the cross-staff for taking altitudes, but was incapable of measuring distances.

Thirty-eight years after the discovery of America, when long voyages had become comparatively common, Gemma Frisius wrote upon astronomy and cosmogony, with the use of the globes. His book comprehended much valuable information to mariners of that day. The system adopted is that of Ptolemy. The following are some of the points of interest for the subject before us. There is a good description of the sphere and its circles; the obliquity of the ecliptic is given as $23^{\circ} 30'$. The distance between the meridians is to be measured on the equator, allowing 15° to an hour of time; longitude is to be found by eclipses of the moon and conjunctions, and reckoned from the Fortunate Islands (Azores). Latitude should be measured from the equator, not from the ecliptic. The use of globes is very thoroughly and correctly explained.

In 1537 Pedro Nuñez (Nonius), cosmographer to the king of Portugal, published a work on astronomy, charts, and some points of navigation. He recognized the errors in plane charts, and tried to rectify them. To Nuñez has been erroneously attributed the present mode of reading the exact angle on a sextant, the scale of a barometer, and various other things, the credit of which is due to Vernier nearly a hundred years later. In 1545 Doctor Pedro de Medina published *The Art of Navigation* at Valladolid, dedicated to Don Philip, prince of Spain. This appears to be the first book ever published professedly on navigation. In 1556 Martin Cortes published at Seville *The Art of Navigation*. He gives a good drawing of the cross-staff and astrolabe, also a table of the sun's declination for four years, and a calendar of saints' days. The motions of the heavens are described according to the notions then prevalent, the earth being viewed as fixed. He recommends the height of the pole being found frequently, as the estimated distance run was imperfect. He devised an instrument whereby to tell the hour, the direction of the ship's head, and where the sun would set. A very correct table is given of the distances between the meridians at every degree of latitude, whereby a seaman could easily reduce the difference of longitude to departure. Gerhard Mercator's great improvements in charts have been noticed in the article MAP.

The Dutch published charts made up as atlases as early as 1584, with a treatise on navigation as an introduction.

In 1585 Roderico Zamorano, who was then the lecturer at the naval college at Seville, published a concise and clearly-written compendium of navigation; he follows Cortes in the desire to obtain better charts.

In 1594 Blundeville published a description of Mercator's charts and globes; he confesses to not having known upon what rule the meridians were enlarged by Mercator, unless upon such a table as Wright had sent him.

In 1594 the celebrated navigator John Davis published a pamphlet of eighty pages, in black letter, entitled *The Seaman's Secrets*, in which he proposes to give all that is necessary for seamen—not for scholars on shore. He defines three kinds of sailing: horizontal, paradoxical, and great circle. His horizontal sailing consists of short voyages which may be delineated upon a plain sheet of paper. The paradoxical or cosmographical embraces longitude, latitude, and distance, the getting together many horizontal courses into one "infallible and true," i.e., what is now called traverse

and Mercator's sailings. His "paradoxical course" he describes correctly as a rhumb line which is straight on the chart and a curve on the globe. He points out the errors of the common or plane chart, and promises if spared to publish a "paradoxical chart." It is not known whether such a chart appeared or not, but he assisted Wright in producing his chart a few years later. His list of instruments necessary to a skillful seaman comprises the sea compass, cross-staff, chart, quadrant, astrolabe, an "instrument magnetical" for finding the variation of the compass, a horizontal plane sphere, a globe, and a paradoxical compass. The first three are sufficient for use at sea, the astrolabe and quadrant being uncertain for sea observations. The importance of knowing the time of the tides when approaching tidal or barred harbors is clearly pointed out, also the mode of ascertaining it by the moon's age. A table of the sun's declination is given for noon each day during four years, 1593-97, from the ephemerides of Stadius. A specimen log-book provides one line only for each day, but the columns are arranged similarly to those of a modern log. Under the head of remarks after leaving Brazil, we read, "the compass varied 90° , the south point westward." He states that the first meridian passed through St. Michael, because there was no variation at that place; the meridian passed through the magnetic pole as well as the pole of the earth. He makes no mention of Mercator's chart, nor of Cortes or other writers on navigation.

The great mark which Wright made in the world was the discovery of a correct and uniform method for dividing the meridional line and making charts which are still called after the name of Mercator. He considered his charts as true as the globe itself; and so they were for all practical purposes.

When Napier's *Canon Mirificus* appeared in 1614, Wright at once recognized the value of logarithms as an aid to navigation, and undertook a translation of the book, which he did not live to publish (see NAPIER). E. Gunter's tables (1620) made the application of the new discovery to navigation possible, and this was done by T. Addison in his *Arithmetical Navigation* (1625), as well as by Gunter in his tables of 1624 and 1636, which gave artificial sines and tangents, to a radius of 1,000,000, with directions for their use and application to astronomy and navigation, and also logarithms of numbers from 1 to 10,000. Several editions followed, and the work retained its reputation over a century. Gunter invented the sector, and introduced the meridional line upon it, in the just proportion of Mercator's projection.

The power of taking observations correctly, either at sea or on shore, was greatly assisted by the invention which bears the name of Pierre Vernier, which was published in Brussels in 1631 (see VERNIER). As Vernier's quadrant was divided into half degrees only, the sector, as he called it, spread over $1\frac{1}{2}$ degrees, and that space carried thirty equal divisions, numbered from 0 to 30. As each division of the sector contained twenty-nine minutes of the arc, the vernier could be read to minutes. The verniers now commonly adapted to sextants can be read to ten seconds. About this period Gascoigne applied the telescope to the quadrant (see MICROMETER); and Hevelius invented the tangent screw, to give slow and steady motion when near the desired position. In 1635 Henry Gellibrand published his discovery of the change in variation of the needle, which was effected by his comparing the results of his own observations with those of Burrough and Gunter. The necessity for having correct charts was equalled by the pressing need of obtaining the longitude by some simple and correct means available to seamen; and we

have seen how many plans had already been thought of for this purpose. At one time it was hoped that the longitude might be directly discovered by the variation of the compass. But the only real way of ascertaining the longitude is by knowing the difference of time at two meridians; and till the invention and perfecting of chronometers this could only be done by finding at two places the apparent time of the same celestial phenomenon. The most obvious phenomena to select were the motions of the moon among the sun and stars, which as we have seen were suggested as a means of finding the longitude by Werner in 1514, and continued to receive attention from later writers. The places of stars were derived from various and widely discrepant sources; and almanacs gave little useful information beyond the declination of the sun, the age of the moon, and the time of high water. Another class of phenomena whose comparative frequency recommended them for longitude observations, viz., the occultations of Jupiter's satellites, became known through Galileo's discovery of these bodies (1610.) Tables for these were published by Dominic Cassini at Bologna in 1688, and were repeated in a more correct form at Paris in 1693 by his son, who was followed by Pound, Bradley, Wargentin, and many other astronomers.

The study of this problem was stimulated by the reward of 1,000 crowns offered by Philip III., of Spain, in 1598; the states-general followed with an offer of 10,000 florins. King Charles II. decided upon establishing an observatory in Greenwich Park, and Flamsteed was appointed astronomical observer on March 4, 1675. Though this was not the first observatory in Europe, it was destined to become the most useful, and has fulfilled the important duties for which it was established. It was established to meet the exigencies of navigation, as was clearly stated on the appointment of Flamsteed, and on several subsequent occasions; and we see now what an excellent foster-mother it has been to the higher branches of that science. The government did not provide a single instrument. Flamsteed entered upon his important duties with an iron sextant of seven feet radius, a quadrant of three feet radius, two telescopes, and two clocks. Tycho Brahe's catalogue of about a thousand stars was his only guide. In 1681 he fitted a mural arc which proved a failure. Seven years after another mural arc was erected with which he set to work in earnest to verify the latitude, and to determine the equinoctial point, the obliquity of the ecliptic, the right ascension and declination of the stars, till he numbered two or three thousand which appeared in the "British catalogue." (See FLAMSTEED and ASTRONOMY.)

Flamsteed died in 1720, and was succeeded by Halley, who paid particular attention to the motions of the moon with a view to the longitude problem. A paper which he published in the *Phil. Trans.*, 1731, No. 421, shows what had been accomplished up to that date, and proves that it was still impossible to find the longitude correctly by the moon.

From the year 1714 the history of navigation in England is closely associated with that of the "commissioners for the discovery of longitude at sea," a body constituted by Act 13 Anne, c. 14, with power to grant sums not exceeding £2,000 to assist experiments and reward minor discoveries, and also to judge on applications for much greater rewards which were offered to open competition. For a method of determining the longitude within sixty geographical miles, to be tested by a voyage to the West Indies and back, the sum of £10,000 was offered; within forty miles, £15,000, within thirty, £20,000. The suggestions and applications sent in to the commissioners were naturally very

numerous and often very trifling; but they sometimes furnish useful illustrations of the state of navigation.

One of the first points to which the attention of the commissioners was directed was the survey of the coasts of Great Britain, which was pressed on them by Whiston in 1737. He was appointed surveyor of coasts and headlands, and in 1741 received a grant for instruments. An act passed in 1740 enabled the commissioners to spend money on the survey of the coasts of Great Britain and the "plantations." At a later date they bore part of the expenses of Cook's scientific voyages, and of the publication of their results. Indeed it is to them that we owe all that was done by England for surveys of coasts, both at home and abroad, prior to the establishment of the hydrographic department of the Admiralty in 1795. But their chief work lay in the encouragement they gave on the one hand to the improvement of timepieces, and on the other to the perfecting of astronomical tables and methods, the latter issuing in the publication of the *Nautical Almanac*.

The introduction of timekeepers by which Greenwich time can be carried to any part of the world, and the longitude found with ease, simplicity, and certainty is due to the invention of John Harrison. The idea of keeping time at sea was no novelty. HUYGENS (*q.v.*) made pendulum watches for the purpose prior to 1665, at which date Major Holmes communicated to the Royal Society (*Phil. Trans.*, i. 13) the fact of his having tried two of them on the coast of Guinea. He sailed from St. Thomas, set his watches, sailed west 700 or 800 leagues, without changing course, then steered toward the coast of Africa north-northeast 200 or 300 leagues. The masters of the other ships under his charge, fearing the want of water, wished to steer for Barbados. Holmes, on comparing the calculations, found them to differ from him from 80 to over 100 leagues. He considered that they were only thirty leagues from the Cape Verd Islands, where they arrived next afternoon.

Harrison's great invention was the principle of compensation through the unequal contraction of two metals, which he first applied in the invention of the compensation pendulum, still in use, and then modified so as to fit a watch, devising at the same time a means by which the watch retains its motion while being wound up. To what has been said in the article HARRISON on his successive attempts, and the success of the trial journey to Jamaica in 1761-62, it may be added that by the journal of the House of Commons we find that the error of the watch (as if there were only one) was ascertained by equal altitudes at Portsmouth and Barbados, the calculations being made by Short. The watch came greatly within the limits of the act.

One might have supposed that Harrison had now secured the prize; but there were powerful competitors who hoped to gain it by lunars, and a bill was passed through the House in 1763 which left an open chance for a lunarian during four years. A second West Indies trial of the watch took place between November, 1763, and March, 1764, in a voyage to Barbados, which occupied four months; during which time it is said, in the preamble to Act 5 Geo. III., 1765, not to have erred ten geographical miles in longitude. In February, 1765, the commissioners of longitude expressed an opinion that the trial was satisfactory, but required the principles to be disclosed and other watches made. Half the great reward was paid to Harrison under Act of Parliament in this year, and he and his son gave full descriptions and drawings, upon oath, to seven persons appointed by the commissioners of longitude. The other half of the great reward was promised to Harrison when he had made other timekeepers to the satis-

faction of the commissioners, and provided he gave up everything to them within six months. The second half was not paid till 1773, after trials had been made with five watches. These trials were partly made at Greenwich by Maskelyne, who, as we shall see, was a great advocate of lunars, and was not ready to admit more than a subsidiary value to the watch. A bitter controversy arose, and Harrison in 1767 published a book in which he charges Maskelyne with exposing his watch to unfair treatment. The feud between the astronomer-royal and the watchmakers continued long after this date.

Meantime the steady progress of astronomy both by the multiplication and increased accuracy of observations, and by corresponding advances in the theory, had made it possible to construct greatly improved tables. In observations of the moon Greenwich still took the lead; and it was here that Halley's successor Bradley made his two grand discoveries of aberration and nutation which had added so much to the precision of modern astronomy. Kepler's Rudolphine tables of 1627 and Street's tables of 1661, which had held their ground for almost a century, were rendered obsolete by the observations of Halley and his successor. At length, in 1753, in the second volume of the *Commentarii* of the Academy of Göttingen, Tobias Mayer printed his new solar and lunar tables, which were to have so great an influence on the history of navigation.

In 1761 Maskelyne was sent to St. Helena to observe the transit of Venus. On his voyage out and home he used Mayer's printed tables for lunar determinations of the longitude, and from St. Helena he wrote a letter to the Royal Society, in which he described his observations made with Hadley's quadrant of twenty inches radius, made by Bird, and the glasses ground by Dollond. He took the observations both ways to avoid the errors. The arc and index were of brass, the frame mahogany; the vernier was subdivided to minutes. The telescope was six inches long, magnified four times, and inverted. On his return to England Maskelyne prepared the *British Mariner's Guide* (1763), in which he undertakes to furnish complete and easy instructions for finding the longitude at sea or on shore, within a degree, by observing the distance between the moon and sun, or a star, by Hadley's quadrant. The errors which he said were inseparable from the dead-reckoning "even in the hands of the ablest and most skillful navigators," amounting at times to fifteen degrees, appear to be overestimated. On the other hand, the lunar equations, which were from Mayer's tables, would, he believed, always determine the longitude within a degree, and generally to half a degree, if applied to careful observations.

In 1765 Maskelyne became astronomer-royal, and was able to give effect to his own suggestion by organizing the publication of the *Nautical Almanac*. The same Act of 1765 which gave Harrison his first £10,000 gave the commissioners authority and funds for this undertaking. Mayer's tables, with his MS. improvements up to his death in 1762, were bought from his widow for \$15,000; \$1,500 was granted to the famous mathematician Euler, on whose theory of the moon Mayer's later tables were formed; and the first *Almanac*, that for 1767, was published in the previous year. At the cost and under the authority of the commissioners of longitude. This was not the first almanac in the country, perhaps by a hundred, as that name was applied to small periodical works, frequently of a frivolous character—though the later and better description gave the sun's declination and moon's meridional passage approximately. In 1606 the French nautical almanac for the following year appeared, and

improvement on what had been before issued by private persons, but it did not attempt to give lunar distances. In the English *Nautical Almanac* for 1767 we find everything necessary to render it worthy of confidence, and to satisfy every requirement at sea. The great achievement was that of giving the distance from the moon's center to the sun, when suitable, and to about seven fixed stars, every three hours. The mariner has only to find the apparent time at ship, and clear his own measured distance from the effects of parallax and refraction (for which at the end of the book are given Lyon's and Dunthorn's methods), and then by simple proportion, or proportional logarithms, find the time at Greenwich. The calculations respecting the sun and moon were made from Mayer's last manuscript tables under the inspection of Maskelyne, and were so continued till 1804. The calculations respecting the planets are from Halley's tables, and those of Jupiter's satellites from tables made by Wargentin and published by Lalande in 1759, except the fourth satellite.

From 1777 to 1788 inclusive, the moon's place was calculated from improved tables by Charles Mason, founded on observations by Bradley, which were published in the *Nautical Almanac* for 1774. The difference then only amounted to 1" in longitude, the apogee 56", and the ascending node 45". From 1789 to 1804 the tables were further corrected by Mason, and calculated to tenths of a second. The distances between the moon and the stars were still further corrected by the use of Taylor's logarithms to seconds, and their places by Bradley's observations in 1756 and Maskelyne's in 1809. The places of the planets at that time were from Lalande's *Astronomy* (the third edition was published in 1792), more recently from vol. iii. of Professor Vince's *Astronomy*. The places of the moon since the beginning of 1821 were calculated from Burckhardt's tables. They are now taken from Hansen's tables, completed with the aid of the English Government in 1857. The eclipses of Jupiter's satellites for 1824 and following years were from Delambre's new tables. In 1827 the positions of sixty of the principal stars were given for every tenth day, from the tables of Maskelyne and Doctor Pearson. Since 1824 the work has been printed three and latterly four years in advance.

The plan of the *Nautical Almanac* was soon imitated by other nations. In France the Académie Royale de Marine had all the lunar distances translated from the British *Nautical Almanac* for 1773 and following years, retaining the Greenwich time for the three-hourly distances. The tables were considered excellent, and national pride was satisfied by their having been formed on the plan proposed by Lacaille. They did not imitate the mode given for clearing the distance, considering their own better.

Though the Spaniards were leaders in the art of navigation during the sixteenth and seventeenth centuries, it was not till November 4, 1791, that their first nautical almanac was printed at Madrid, having been previously calculated at Cadiz for the year 1792. They acknowledge borrowing from the English and French.

After Maskelyne's death the correctness and reputation of the *Nautical Almanac* underwent a serious decline. The matter came before parliament in 1818, when the board of longitude was reconstructed, and the old acts consolidated. Dr. T. Young was appointed secretary to the commissioners, and superintendent of the *Almanac*. Ten years later, in 1828, the board was swept away, the *Almanac* was placed under the Admiralty, and Young, with Faraday as a chemist and Sabine as a practical observer, were appointed scientific advisers to the Admiralty, which ever since has spent a certain annual sum on scientific research.

The ultimate result of these controversies was the appearance of the new and reformed *Nautical Almanac* in 1834. It may be added that the last remnant of the old laws, the protection of the *Almanac* against competition by a penalty, was abolished by an act passed August 6, 1861. The sale of the *Nautical Almanac* has lately decreased on account of the amount of information given in private publications.

Prior to 1795 the nautical portion of the British community, including the royal navy, were entirely dependent upon private industry and enterprise for charts and sailing directions. On August 12th of that year an order in council placed all such articles as were then in the possession of the Admiralty in charge of Mr. Dalrymple, an eminent publisher of such things, who had long been employed by the East India Company, and whose catalogue in 1786 contained 347 charts between England, the Cape, India, and China; thus the germ of the hydrographic department was established. The expense was then limited to \$3,250 a year, just one-tenth of what was allowed last year for drawing and engraving charts alone, besides \$27,500 for printing and mounting them. In 1881 there were 118,542 charts sold.

The question of the accuracy with which the sea charts now represent a portion of the globe is entirely set at rest by the possession of a correct knowledge of the figure and size of the earth, as well as the means of ascertaining the latitude and longitude of innumerable places (see EARTH and GEOGRAPHY). They are now made as precisely as possible to represent the actual surface of the globe. The result of each survey is first plotted with the meridian lines inclined toward the pole, by which means all astronomical bearings coincide. It is afterward opened proportionately to suit Mercator's projection and the sailor's use, as far as 70 or 80 degrees. For the polar regions a circular projection is used, which may comprise a radius of 30 or even 40 degrees.

At the commencement of the present century all watches designed for the discovery of the longitude were called "chronometers;" they were but slowly coming into general use; the Admiralty only supplied them to flagships, surveying ships, and exploring expeditions. Later every ship of war was allowed one, and an additional one if the captain possessed one of his own. The East India Company allowed their ships one each at an early date. Now flagships are allowed five, and ordinary ships of war three each. Chronometers were soon recognized as a certain and simple means of ascertaining the difference of longitude between two places; Captain Cook and others used them in the last century. The elaborate chronometric expeditions of English, Continental and American astronomers belong rather to the history of astronomy. When the Atlantic cable was laid to Newfoundland in July, 1866, and time-signals received direct from Greenwich Observatory to Heart's Content, the Admiralty chart was found to be quite correct. In a similar manner all the principal places in North and South America and the West India Islands have been connected by time-signals with the United States observatories within the last seven years, and found to be fairly correct, the error seldom amounting to two seconds in time. The observatory at Lisbon was found to differ eight seconds of time. It may now be assumed that there is no place within the ordinary navigable parts of the ocean where an error in position exists of sufficient amount to affect a ship's safety.

NAVIGATION LAWS. These laws are a branch rather of municipal law than of the general maritime law (for which see SEA LAWS). They are based upon the right of a state to regulate the navigation of its own

waters and to protect its own commerce, and may be divided into two classes.

The first class includes all those laws, once so numerous, designed to secure a commercial monopoly to the state which enacted them. Any advantages which a British ship has, *e.g.*, the right of claiming protection for her flag, the non-attachment to her of a maritime lien for necessities supplied in a British port, are not directly connected with the policy under which the Navigation Acts have become obsolete. These advantages are not secured to a British ship until she is registered. American law agrees with British in this respect. The United States have imitated the policy of England and other commercial nations in conferring peculiar privileges upon American-built ships and owned by our own citizens. The object of the Registry Acts is to encourage our own trade, navigation, and shipbuilding by granting peculiar or exclusive privileges of trade to the flag of the United States, and by prohibiting the communication of those immunities to the shipping and mariners of other countries. It may be noticed that an alien is generally incapable of becoming the owner of a ship. This incapacity is specially preserved in the case of British ships by the Naturalization Act, 1870.

The second class of navigation laws includes those which deal with the navigation of any waters over which a state has any control, and embraces all that is necessary for the due use of such waters, as rules of the road, management of harbors and lighthouses, and licensing and control of pilots. Such laws may deal with (1) the high seas, (2) tidal waters other than the high seas, (3) non-tidal waters. The claims of various nations to dominion over parts of the high seas have now become matters of merely historical interest. Such claims have been at different times advanced by Great Britain, Holland, Spain, and Portugal, and were once sufficiently important to evoke the *Mare Liberum* of Grotius, and the *Mare Clausum* of Selden. But, though such claims upon the high seas have long been relinquished, rules for the navigation of the high seas may still be promulgated by any government. In Great Britain such rules have been made by order in council under the powers of the Merchant Shipping Act, 1862; the rules at present in force are those contained in the order of August 14, 1879. To these rules all the states of Europe except Turkey, and in America the United States, Chili, Brazil, and Ecuador, have assented, so that as far as the assenting states are concerned they are of universal validity. In the case of a state which has not assented to them, the only rules enforceable are the general rules of the sea, gradually ascertained by individual cases before courts of admiralty.

For navigation of its tidal waters—so far as they are territorial—a state may legislate without the assent of other states.

Non-tidal waters, even though navigable, are in Great Britain *prima facie* private waters, in which the right of navigation does not exist as a public franchise, but can only be acquired by prescription, founded on a presumed grant by an owner. In Roman law and in the Code Napoléon it is otherwise. Navigable rivers in those systems are always *publici juris*, whether tidal or non-tidal.

The distinction drawn in the United States between navigable and boatable rivers seems to be peculiar to this country, unless indeed it is analogous to the "*fleuves et rivières navigables ou flottables*" of the Code Napoleon, §538. It is at least unknown in Great Britain.

The international law as to the navigation of the high seas has been sketched above. As to territorial waters,

it is the general though not the universal opinion of jurists that the state to which the territorial waters belong has a right to forbid their navigation by foreigners. The free navigation of rivers has often been the subject of treaties, almost necessarily so where the river is the boundary between two states. In such a case, if a state were to maintain the strict letter of its rights, navigation would be almost impossible, as each state is proprietor down to the middle line of the bed of the river. By the treaty of Vienna in 1815 it was provided that the navigation of all rivers separating or traversing the states that were parties thereto should be open for commercial purposes to the vessels of all nations, subject to a uniform system of police and tolls. The treaty of Paris, 1856, extended this principle to the Danube. In America the cases of the Mississippi and the St. Lawrence are important. By the treaty of Versailles, 1783, it was provided that "the navigation of the Mississippi shall forever remain free and open to the subjects of Great Britain and the citizens of the United States." But the United States afterward acquired Louisiana and Florida; and, the stipulation as to British subjects not being renewed in the treaty of Ghent, 1814, the United States maintain that the right of navigating the Mississippi is vested exclusively in their citizens. As to the St. Lawrence, after disputes for a long period between Great Britain and the United States, the right of free navigation for purposes of commerce was secured to the United States by the treaty of Washington, 1871. There are some waters, such as the Bosphorus and the Suez Canal, which are subject to peculiar engagements by treaty or agreement. But as a rule it may be said that in time of peace the territorial waters of a state are open to foreigners for commercial purposes, subject to observance of any rules as to police, pilotage, etc., imposed by the state.

NAVIGATORS' ISLANDS, or SAMOA, a group in the southern Pacific, 420 miles northeast of the Fiji Islands. It numbers in all thirteen islands, but most of these are little more than barren rocks, and three only—Sawaii (Pola), Upolu (Oyalava), and Tutulia (Mauna)—are large enough to be of any importance. Sawaii (700 square miles) is almost entirely occupied by lofty and barren mountains. Upolu (550 square miles) is also mountainous, but it is well-wooded and fertile, and possesses several considerable streams. Apia, the chief town, lies at the head of an oval bay on the north coast. Since 1879 it has been under a municipality directed by the consuls of Germany, Great Britain, and the United States. Tutulia (fifty-five square miles, seventeen miles long and five broad) is almost cut in two by the harbor of Pago-pago (Pango-pango), one of the best in the South Pacific. In general character the island is like Upolu. The Samoans are physically a fine race of men, and those on Upolu are all nominally Christian; but they discover a great lack of industry and perseverance. A series of petty wars continued with little intermission from 1868, has greatly interfered with the prosperity of the native population. Since Jan. 1900, the island of Tutulia and other smaller Samoan islands, have come into the possession of the U.S.

NAVY. A comparison of the matériel of modern navies would be very misleading if it only took into account the number and power of the regular ships of war, because for some important services there is but little difference between the value of the ship built for war purposes and of that only adapted to such purposes at need. The increasing vulnerability of the ship of war, however carefully built, to weapons which the adapted merchant ship can employ is one of the most notable features in the modern aspect of maritime warfare. The statesman who desires to

estimate the naval resources of empires or states will need to consider the quality and extent of their mercantile marine in fast steamships and trained men as well as the number and efficiency of their regular ships of war, and their actual war personnel. A comparison limited to armored or ironclad ships is vitiated by the defect that it does not account for the protection afforded to what are called unarmored ships by other means than that of armoring their sides. This is fast becoming so considerable that a new term has been introduced (protected ships) to distinguish such vessels from ordinary unarmored fighting ships.

The American navy came into existence shortly after the Declaration of Independence. The first force, consisting of purchased vessels, badly fitted and built, and insufficiently equipped and manned, embraced two ships of twenty-four guns each, six brigs, carrying from ten to twelve guns each, two schooners, each with eight guns, and four sloops, three of ten guns and one of four guns. In November, 1776, the grades of admiral, vice-admiral, rear-admiral, and commodore were assimilated in rank and precedence to relative army titles, but they were never created by law until 1862. During the war a number of spirited engagements occurred, but there was a great lack of efficient material at home, and agents abroad were not able to enlist the active sympathies of nations or rulers. Benjamin Franklin did manage to equip one good squadron, but this was rendered almost useless by internal dissensions, and it required the victory of Paul Jones in the *Bon Homme Richard* over the *Serapis* to bring about any tangible result for the risk taken. During the war 800 vessels of all classes were made prizes, but the navy lost, by capture, eleven vessels of war and a little squadron of gun-boats on the lakes; and, with thirteen ships destroyed to avoid capture by the British, five condemned and three wrecked at sea, the country was practically without a naval force between 1780 and 1785.

Owing to the depredations upon commerce of the Barbary powers, Congress, in 1794, ordered the construction of six frigates, but the Berbers having made peace, the number of vessels was reduced one-half, and no additions were made until 1797, when the *Constitution*, *United States*, and *Constellation* were built. Trouble with France from 1798 to 1801 resulted in the formation of four squadrons operating in the West Indies; these numbered twenty-one vessels in all, and, besides capturing nearly 100 prizes, they gained experience and prestige by many short and decisive single actions. No further increase was made until 1802, when the war with Tripoli was declared; up to this time the navy had cost the country, including sites for navy-yards, only \$10,000,000.

At the breaking out of hostilities with Great Britain in June, 1812, the naval force of the United States consisted of a number of gunboats fitted for the protection of rivers and inlets, and of seventeen sea-going ships, nine of which were below the frigate class. In 1846 California was seized, and during the war the United States vessels were employed in blockading or capturing the ports upon both seabords of Mexico, and in coöperating with the army—all hostilities ceasing in 1847 with the occupation of the city of Mexico. In 1848 Lieutenant Lynch commanded an expedition engaged on the exploration of the Dead Sea and the river Jordan; in 1856 the *Advance* and *Rescue* searched for Sir John Franklin, followed later by the expeditions of Kane and of Hartstene; in 1854 Strain made a partial survey of the Isthmus of Panama; and in 1855 Rear-Admiral John Rodgers, in the *Vincennes*, went farther into the Arctic Ocean through Behring's

Strait than any previous navigator. In 1858 the Paraguay expedition successfully finished its work; and for many years, earnestly aided by Great Britain, a squadron was employed on the coast of Africa and in the West Indies for the suppression of the slave-trade.

The Civil war broke out in April, 1861, and its naval character was marked by two leading features; the first was that, while one side had a small force of naval vessels, which were generally good of their kind, the other entered the contest with absolutely nothing that could be called a man-of-war; the second was that, though certain developments in the character and construction of ships and weapons had been foreshadowed before the war, and had even been partially realized, it was during the progress of the struggle that those changes took place in marine warfare which amounted to a revolution. The effect of rifle and shell-fire, the employment of the ram, the destructive energy of torpedoes, the application of armor to the sides of vessels, and the superiority of iron-armored ships—all taught in practice what theory had in vain asserted.

Since the close of the war the United States navy has been doing excellent service in the peaceful pathways of science and humanity, the only warlike demonstrations having been that against Formosa in 1867 and that against Corea in 1870. Expeditions have been sent to the Arctic Ocean; ships have been employed in the survey of every sea; deep-sea soundings have been made both in the Atlantic and in the Pacific; and five expeditions have tried to solve the problem of the best route for a trans-isthmian and inter-oceanic canal; scientific observers have occupied stations, and with important results, in the transit observations, and to-day the chain of telegraphic measurements of longitude around the whole world is the work of American naval officers.

During the revolutionary war Congress through its committees and agents managed naval affairs. In 1789 these duties were intrusted to the secretary of war, and it was not until 1798 that the "department of the navy" was established. The bureaus are—(1) navigation, which controls all matters relating to pilotage and navigation, with a direct superintendence of the naval observatory and of the hydrographic, signal, naval intelligence, *Nautical Almanac*, war record, compass, and detail offices—this last having charge of the *personnel* of the service; (2) ordnance, which administers all artillery, ordnance and torpedo matters; (3) equipment and recruiting, which is in charge of outfits, equipments, stores, recruiting, and apprenticeships; (4) yards and docks, which superintends the construction of docks, naval grounds, buildings, and all civil-engineering work; (5) medicine and surgery; (6) provisions and clothing, which is responsible for the supplies of food, water and clothing, and manages the accounts, thus performing under one direction these duties relegated in the army to the quartermaster, commissary, and paymaster; (7) steam engineering, which designs and has the care of engines and boilers; and (8) construction and repair, which performs the same duties for ships. The first four bureaus are under the direction of line-officers of the navy.

The Naval Asylum is situated at Philadelphia; and at Newport, R. I., are the headquarters of the torpedo station and of the training system for apprentices. The naval experimental battery is at Annapolis, though not a part of the Naval Academy; and in all the large seaboard towns are rendezvous for the shipping of men, and branches of the hydrographic office for the dissemination of maritime information.

The coast survey and lighthouse establishment, both mainly in charge of naval officers, the revenue marine, life-saving, steamboat inspection, and marine hospital services are all a part of the treasury department; the transfer of their control to the navy department is asked of Congress by the secretary of the navy, who also recommends the establishment, under his administration, of a bureau of mercantile marine, the duties of which will be analogous to those of the mercantile marine department of the Board of Trade.

In describing the navies of to-day it is necessary to abandon all old ideas of what they were, or looked like, and to consider the details of an enormous and radical change. The old sailing frigate, an imposing monster of the sea, has gone, and the present generation will know nothing of the towering masts, the enormous spread of canvas, the rows of guns tier above tier, the swarms of sailors. The smallest vessel of the present American squadron, with her six guns, would destroy an entire fleet of "Constitutions" or "Arethusas." The seaman is now also a soldier. He is an expert in the intricate machinery of revolving cannon and the complications of the rifled breech-loader that weighs more than twenty tons and can be raised, lowered and turned by one man. He must understand the hydraulics and hydrostatics that are connected with his daily drill. He has a magazine rifle and a self-cocking revolver. A crew of 180 men comprises expert electricians, machinists, and boiler-makers. The articles issued to the crew include the general supplies of a small town, with razors, tobacco and whisk-brooms, but no "grog." There is a library. There is a tailor with a sewing-machine, and an equipped barber's shop. Yet the old qualities must remain. These new sailors are as capable as ever of battling for life against wind and wave, or of fighting like demons amid the roar of guns and the smoke of battle.

The study of the modern navy is also the study of artillery and fighting-machines of all kinds. We have brought the torpedo almost to perfection, and have all the kinds that any nation has, with an aerial one exclusively our own, which is the Zalinsky pneumatic gun. Tubes connected with chambers of compressed air throw two hundred pounds of explosive gelatine a mile. This missile, falling within a radius of 25 feet of her, will sink any iron-clad afloat. One little shell, well aimed, from a four-inch rifle, will disable the biggest gun of an enemy, and a small active vessel has it in her power to sting to death a floating castle. In structure and appearance startling innovations have come about. Ancient ideas have been revived in the ram, with a huge steel beak, and in the castellated battle-ship which rises from the water like some unique shore defense in which masts, spars, cordage, and canvas are all discarded, whose battlements bristle with machine guns, and whose thick steel sides can brave with indifference all the power of mere gunpowder and iron.

The present navy of the United States may be said to have been begun as recently as 1889. There were at that date only projected the two armored vessels, Maine and Texas, and the coast defense ram Monterey. The report of the navy department for that year strongly recommended the building of first-class fighting ships, and an Act of Congress, of June, 1890, authorized the beginning of our present navy, growing year by year since that date, in providing for the construction of three sea-going ships costing about \$3,000,000 each.

At that time there was not in this country a plant that could make an armor-plate or produce a modern rifle. A policy of delay was adopted, much criticized

at the time, by which appropriations could be accumulated until the aggregate would tempt the establishment of the costly machinery necessary. The plan succeeded, and we now build our own ships and our own guns, the latter of which are unquestionably the best made in the world. The change was necessarily radical. Previous to that we had been content with smooth-bores, 9 inch; wherewith ten pounds of powder pushed a 70 pound projectile with an energy of 847 foot-tons. Now, 10 inch rifles, with 425 pounds of powder, push with a power of 25,990 foot-tons a projectile weighing 850 pounds, adequate to pierce any iron-clad afloat. One lieutenant immediately proceeded to invent rapid-fire guns, 4 inches to 6 inches caliber, capable of piercing four inches of steel armor at 1,000 yards, and strike a 6-foot target at that distance five times in thirty-one seconds.

The appropriations for the creation of the new navy of the United States provide for the most effective armament ever constructed, and provision for defense is as adequate as that for offense. The bows are powerful rams, and bow and stern can be shot away without endangering the ship. In the latest projections it is intended to produce ships absolutely without parallel in the world. They have the combination of sufficient armament, with complete protection against ordinary modern guns, while they have a sea-speed and endurance hitherto unknown to ships of war. They are equipped with triple-expansion engines, 3 screws, 20,000 horse-power easily developed, a speed of 22 knots, and steaming at 10 knots can travel a distance of 25,520 miles without re-coaling.

Building and launching at a rate of three or four a year, any list of these vessels would in a short time be incomplete. The following list will convey some idea of the present navy. The change, as stated, is not so much in number as in kind, quality and effectiveness, and in that contrast between the old and the new which is the chief item now to be considered.

Among vessels of the first rate are the Chicago, 4,500 tons; Baltimore, 4,400 tons; Philadelphia, 4,324 tons; Newark, 4,083 tons; San Francisco, 4,083 tons, all protected cruisers. Of the second rate are the Maine, 6,648 tons; Texas, 6,300 tons, both armored steel vessels, and the Charleston, 3,730 tons; Atlanta, 3,000 tons; Boston, 3,000 tons; Lancaster, 3,250 tons; Pensacola, 3,000 tons; Hartford, 2,900 tons; Richmond, 2,700 tons; Omaha, 2,400 tons, all armored steel vessels. Of third rates there are the Puritan, Amphitrite, Miantonomoh, Monadnock, Terror, all double-turreted monitors. There are thirteen single-turreted monitors whose machinery and armament are obsolete, but whose hulls are first-class, which lie under paint and canvas to await an emergency. There are also some 18 old-type unarmored cruisers, while the Yorktown, Bennington, Concord and Dolphin are steel vessels of new design. The Petrel is the only modern vessel now finished among the fourth rates, this is of 885 tons displacement. There are two torpedo boats, 11 tugs and 15 sailing vessels and receiving ships.

To the above may be added, some of them building and several already launched, three steel-belted battle-ships of 10,200 tons each; one armored steel cruiser of 8,100 tons; one barbet-turret coast-defense vessel of 4,048 tons; one harbor-defense ram of 2,050 tons; two protected cruisers of 7,400 tons each; one of same class of 5,500 tons; two of same of 3,183 tons; three of same of 2,000 tons; two gun-boats of 1,050 tons; one practice-vessel of 838 tons for the use of the naval cadets; three tugs of 192 tons each. The harbor-defense ram "Katahdin" was launched Feb.

4th, 1893, and this vessel is unique in having tanks for submerging the vessel in action until nothing but her invulnerable "turtle" back is exposed to fire, and in being able to steam thus seventeen knots an hour. There are also building the Iowa, a battle-ship, to cost more than three millions of dollars, and the Brooklyn, an armored cruiser to cost nearly three millions. Also the Olympia, a cruiser of the class of the Chicago and Charleston, to make twenty knots an hour, and to carry an armament of four 8-inch breech-loading guns, ten 5-inch rapid-fire guns; fourteen 6-pounders, and six 1-pounder rapid-fire guns. This vessel will cost nearly two millions.

In the United States Navy there are under present regulations 6 Rear-Admirals, 10 Commodores, 45 Captains, 85 Commanders, 74 Lieutenant Commanders, 250 Lieutenants, 75 Junior Lieutenants, 184 Ensigns. There are 15 Medical Directors, 15 Medical Inspectors, 50 Surgeons, 90 Assistant Surgeons. There is a pay-corps numbering about 100 officers. The Chief and Assistant Engineers number about 208 persons. There are 23 Chaplains, and 12 Professors of Mathematics, with 7 Naval Instructors, 14 Assistants and 10 Civil Engineers. There are upon the present footing 7,500 sailors and 750 apprentices.

The Marine Corps, by which term is designated that body of infantry soldiers whose duties are confined to the navy, has 1 Colonel, 2 Lieutenant Colonels, 5 Majors, 5 of General Staff, 20 Captains, 39 First and Second Lieutenants, and 2,000 rank and file.

The most startling innovation of our navy is that unique vessel whose ammunition is compressed air, whose guns are long tubes without trunnions, and whose destructive qualities have been referred to above. Trials of this naval monster have demonstrated a utility which may yet cause all the splendid armaments mentioned to seem in vain.

NAYLER, or NAYLOR, JAMES, a Puritan fanatic, was born at Andersloe or Ardsley in Yorkshire, England, in 1618, and died in 1660.

NAZARENES, an obscure Jewish-Christian sect or "heresy," existing at the time of Epiphanius in Cœle-Syria, Decapolis (Pella), and Basanitids (Cocabe). According to that authority they dated their settlement in Pella from the time of the flight of the Jewish Christians from Jerusalem, immediately before the siege in 70 A.D.; he characterizes them as neither more nor less than Jews pure and simple, but adds that they recognized the new covenant as well as the old, and believed in the resurrection, and in the one God and His son Jesus Christ.

NAZARETH, in Galilee, now al-Nasira, the city of Mary and Joseph, and the place where our Lord spent his youth, is pleasantly situated in a hollow on the south slope of the hills which bound the plain of Esdraelon on the north. Though it had a synagogue, and is called in the Gospels a city, Nazareth must have been an obscure place in the time of Jesus, for we find no mention of it outside of the New Testament till Eusebius and Jerome identify it with a "village" which undoubtedly occupied the place of the modern Nasira. The place has since passed through various vicissitudes; it was most flourishing in the time of the crusaders, who transferred to it the bishopric of Scythopolis. The Ottomans at length expelled the Christians; but the Franciscans established themselves under the protection of Fakhr al-Din in 1620. The town has now a Greek, a Latin, and a Moslem quarter, as well as a Protestant mission and orphanage. The population is variously estimated at from 6,000 to 10,000.

NAZARITE, or NAZIRITE, was the name among the Hebrews for a peculiar kind of devotee. The

characteristic marks of a Nazarite were unshorn locks and abstinence from wine. Full regulations for the legal observance of the Nazarite vow are given in Numb. vi., where every product of the grape-vine is forbidden, and the Nazarite is further enjoined to abstain from approaching a dead body, even if it be that of his nearest relative.

NEAL, DANIEL, author of the *History of the Puritans*, was born in London in December, 1678. He died in 1743.

NEALE, JOHN MASON, ecclesiastical historian and hymnologist, was born in London, January 24, 1818, and was educated at Trinity College, Cambridge. He became incumbent of Crawley, Sussex, in 1842, and in 1846 warden of Sackville College, East Grimstead, an appointment which he held till his death, August 6, 1866.

NEANDER, AUGUST, one of the most distinguished and influential of the modern theologians of Germany, was born of Jewish parents at Göttingen, on January 17, 1789.

Neander's life was only varied by the successive publications which appeared in such fertility from his pen. In the year 1812 he published a monograph *On St. Bernard and his Age*, and then in 1818 his work on Gnosticism. A still more extended and elaborate monograph than either of the preceding followed, *On Chrysostom*, and again, in 1825, another on Tertullian. He had in the meantime, however, begun his great work, to which these several efforts were only preparatory studies. The first volume of his *General History of the Christian Religion and Church*, embracing the history of the first three centuries, made its appearance in 1826. The others followed at intervals—the fifth, which appeared in 1845, bringing down the narrative to the pontificate of Boniface VIII. A posthumous volume, edited by Schneider in 1852, carried it on to the period of the council of Basel. Besides this great work he published in 1832 his *History of the Planting and Training of the Christian Church by the Apostles*, and in 1837 his *Life of Jesus Christ, in its Historical Connection and Development*, called forth by the famous *Life of Strauss*. In addition to all these labors, he gave to the public many miscellaneous sketches from the history of the church and of theological opinion; as, for example, his *Memorabilia from the History of Christian Life* (1822), his volume under the title of the *Unity and Variety of the Christian Life*, his papers on Plotinus, Thomas Aquinas, Theobald Thamer, Pascal, Newman, Blanco White, Arnold, etc., and other occasional pieces (*Kleine Gelegenheitsschriften*, 1829), mainly of a practical, exegetical, and historical character. Since his death a succession of volumes, representing his various courses of lectures, have appeared (1856-64), in addition to the *Lectures on the History of Dogma*, admirable in spirit and execution, which were edited by Jacobi in 1857. He died on July 14, 1850, worn out and nearly blind with incessant study.

NEANDER, JOACHIM, German hymn-writer, was born about 1650 and died in 1680.

NEARCHUS, son of Androtimus, one of the most distinguished officers in the army of Alexander the Great, and admiral of his fleet, with which he made an important and interesting voyage of discovery in the Indian Ocean. He was a native of Crete.

The voyage of Nearchus has acquired a much greater celebrity than it really deserves, both in ancient and in modern times, from the circumstance that it stood entirely alone in antiquity, the similar expedition of Hanno along the west coast of Africa being almost unknown to both the Greeks and Romans, while in modern days it has attracted a greatly increased amount of

attention from the accidental circumstance that a complete and trustworthy record of it has been preserved. Nearchus himself wrote a detailed narrative of his expedition, of which a regular and full abstract was embodied by Arrian in his work on India—one of the most interesting geographical treatises that have been transmitted to us from antiquity.

NEATH, a municipal and parliamentary borough and market-town of Glamorganshire, South Wales, is prettily situated near the mouth of the Neath, and on two railway lines, eight miles northeast of Swansea and thirty-nine west-northwest of Cardiff.

The population of the municipal borough (1,486 acres) in 1871 was 9,319, and in 1881 it was 10,409. That of the parliamentary borough (1,629 acres) in 1901 was about 12,500.

NEBRASKA, a central State of the American Union, is bounded on the south by Colorado and Kansas, on the east by Missouri and Iowa, on the north by South Dakota, and on the west by Wyoming and Colorado. The width of the State from north to south is $208\frac{1}{2}$ miles, the length from east to west 413 miles and the land area 76,840 square miles, or 49,054,080 acres.

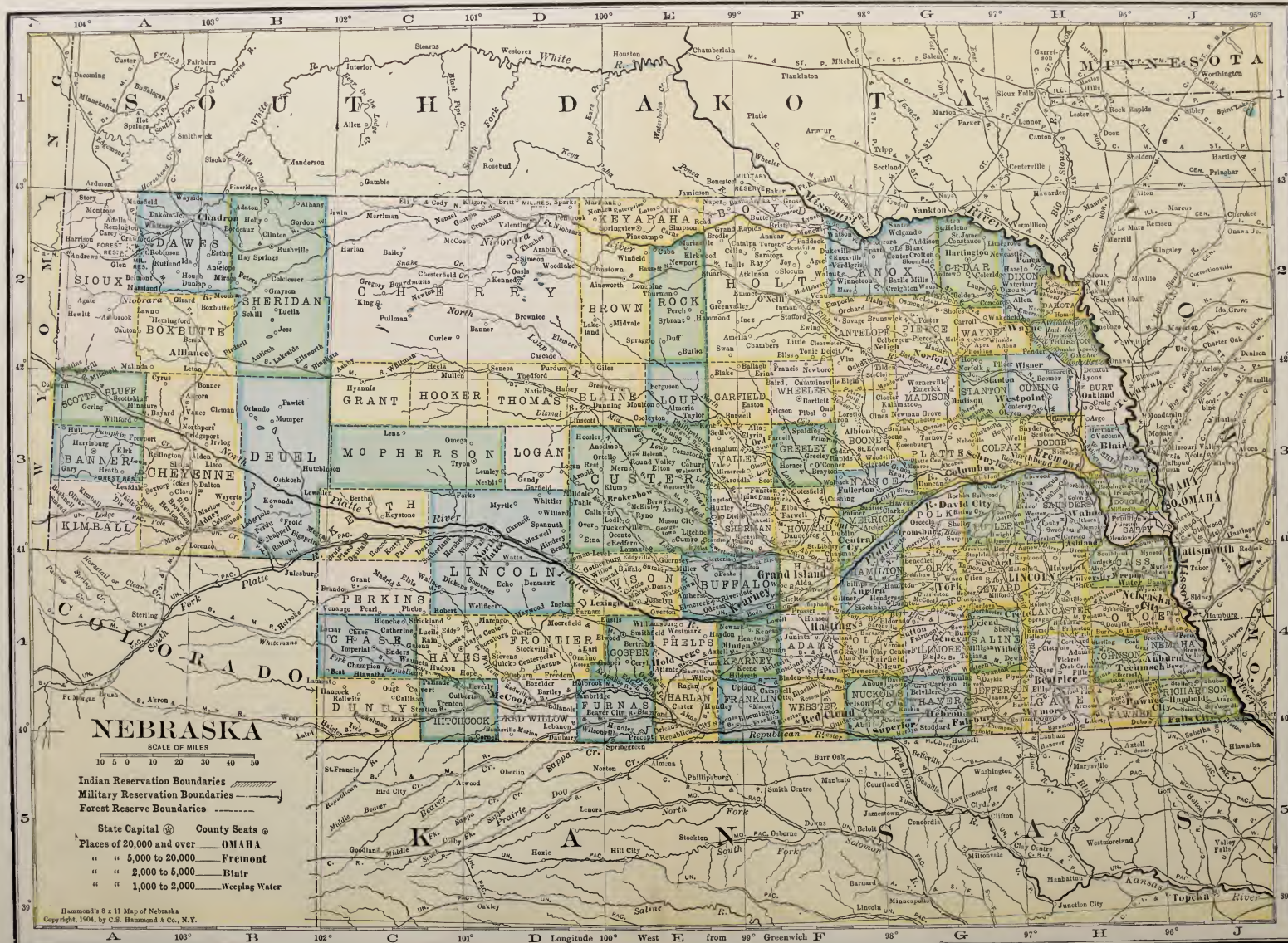
The greater part of Nebraska is a plateau. The lowest point is at the mouth of the Nemaha, in the southeastern part of the State, where the elevation is 880 feet; the highest spot is Scott's Bluffs, in the extreme western part of the State (6,000 feet). The eastern half of the State has an average elevation of 1,400 feet; and the whole State averages 2,312 feet above the sea.

There are no mountains, but in the northern and western parts there are some ridges and a few lofty hills. Generally the slopes are gentle, but occasionally precipitous, and in rare cases there are cañons with perpendicular sides. The lands of three-fourths of the State are gently rolling. The surface owes its present form mainly to erosion. Between all the forms of upland surface the transition is gradual. The bottom lands and valleys are the most conspicuous modifying features of the surface. They are huge shallow troughs, varying in breadth from a quarter of a mile on the smaller streams to twenty-three miles on the Platte and the Missouri. Their numerous terraces, like broad steps, gradually lead to the bordering uplands, which in turn are varied in height and form. Occasionally it is hard to determine where the bottom ends and the bordering bluffs begin, but generally both forms are clearly outlined. The innumerable tributaries that creep quietly into the main bottoms greatly complicate and beautify the forms of landscape. The number of these valleys is very great, the Republican alone having more than four hundred tributaries. Not less than 25 per cent. of the entire surface of the State is composed of well-watered valleys. The few destitute of water are regaining the streamlets of former times through the climatic changes brought on by the settlement of the State. Most of these bottom lands, though composed of the richest vegetable mold and alluvium modified by loess materials, are perfectly dry, and rarely subject to overflow. A clear conception of the topography can only be obtained by crossing the State at right angles to the courses of the valleys. The rolling lands bordering the valleys gradually disappear as the divide is approached which separates one drainage system from the next. Here the land swells out into a gently undulating plain that varies in extent from one to thirty miles. Some of these higher uplands have a great number of shallow basin-like depressions where soil and grasses closely resemble those of the bottom lands. They are the sites of small lakes that recently existed here, and some of them still retain this character, being

filled with fresh water from one to fifteen feet in depth. South of the valley of the Niobrara, and commencing in 100° W. longitude, are the noted sand-hills. They vary in height from a few yards to several hundred feet. Almost every form of wind sculpturing is found, but the conical predominates. Though formerly naked, these hills have recently become covered with grasses which are fixing the sands, and preserving their curious crater-like forms. They extend to the head of the forks of the Loup river, covering an estimated area of 8,000 square miles.

The average mean temperature of the summer months—June, July, and August—in eastern Nebraska is 73° Fahr. At the North Platte it is slightly higher. Excepting a small section in the northwestern part, the whole State is included between the summer isotherms of 72° and 76° . The mean temperature of the autumn months—September, October, and November—is 49° . As excessive rains rarely fall during these months, the comparatively high mean temperature renders the autumn season long and delightfully mild. The isotherm of 20° during the winter months—December, January and February—embraces all of Nebraska except the northwest corner, where the temperature is slightly lower, and the southeast corner where it is slightly higher. The spring months—March, April, and May—have a mean of 47° Fahr. The mean of the whole year is in the southern half of the State 55° , in the northern half $52\frac{1}{2}^{\circ}$. Rarely does the temperature in midsummer rise to 100° . In twelve years the thermometer fell below zero on an average thirteen times a year. The lowest point ever reached was 32° below zero. The heat of summer is constantly modified by breezes. Owing to the dryness of the atmosphere the cold is not felt more when the thermometer registers -20° than in moist regions when it marks only zero. In winter the prevailing winds are from the northwest, changing, as spring advances, to the southwest, from which direction they mainly blow through summer and autumn. During some winters there are occasional wind-storms of great severity, preceded by a fall of snow and followed by very low temperature. Such storms last from one to three days, and when they cease the temperature reaches the lowest point experienced in this region. The extreme cold continues for a few days only. Fortunately the severe types of such storms are rare even here, and the winters on the whole are remarkably adapted to continuous labor in the open air. The atmosphere is wonderfully clear and pure throughout the year; objects can be seen at a great distance, and clouds when formed are outlined with exceptional clearness.

The rainfall in eastern Nebraska is abundant. At the Missouri it averages forty inches a year; 100 miles farther west thirty-two inches; 200 miles west of the eastern boundary thirty inches. Beyond this point it more rapidly lessens until the North Platte is reached in western Nebraska, where the average is only twenty inches. In the end of May, or in early June, when the "big rise" of the Missouri and the Platte occurs, a rainy season invariably commences which lasts from three to eight weeks. As this is the time when crops most need rain, destructive droughts are rare in eastern Nebraska. After the wet season rains still occur, but at longer intervals. During winter rain rarely falls. Snow ranges in depth from one to ten inches. There are many facts that show a constantly increasing rainfall in the State. One reason for this is believed to be the great depth of the soil, and the great increase of absorption produced by cultivation. The loess soils, of which the surface of Nebraska is largely composed, only need the native sod to be broken up to be trans-



muted into a huge sponge absorbing all the moisture that falls on it.

Nebraska is exceptionally healthy, especially for persons of consumptive tendency. This is owing to its elevation above the sea, the dryness of the atmosphere, and the great amount of ozone in it, the prevalence of winds, and the fine natural drainage of the State. The diseases incident to the climate are rheumatism, neuralgia, and in isolated spots malaria. With the progress of settlement, and a lessening exposure, these ailments are gradually disappearing.

In striking contrast to past geological times, there are now no large lakes in Nebraska. There are, however, a great number of small lakelets. Many of these have been formed by "cut offs" on the Missouri, Platte, Elkhorn, Blue, and other rivers. At the head of the Elkhorn river is a region containing over thirty small lakes, many of which are of great beauty, with pebbly bottoms, and water clear as crystal. A still more extensive region of small lakes is at and between the heads of the Loup rivers. At the head of Pine Creek, a tributary of the Niobrara, there are many saline lakelets and ponds. A large saline bog, fed by a vast number of saline springs, covers about 500 acres, two miles west of Lincoln. Many smaller ones exist in the same vicinity. Salt has been manufactured here in considerable quantity by solar evaporation. Springs are abundant along most of the river bluffs and on the rolling lands of eastern Nebraska. On the long reaches of nearly level land springs occur at longer intervals, and on the watersheds still more rarely. Even here water can readily be obtained by wells, from fifteen to fifty feet deep, excepting in a few counties like Clay, Fillmore, Adams, and Phelps, where, owing to the great thickness of the superficial deposits in some localities, shafting must be much deeper. Artesian wells have been successful, the depth at which flowing water has been obtained varying from 500 to 1,000 feet.

The name Nebraska signifies land of broad rivers. Chief of all is the Missouri, which flows in a tortuous course for 500 miles along its eastern boundary, and is navigable for 2,000 miles above Omaha. Next in importance is the Platte, which flows through the whole length of the State from west to east. Rising in lakelets in the Rocky Mountains, fed by snows, its entire length approximates 1,200 miles. When it enters the State it is already a broad and rapid, though shallow river, flowing over a sandy bed. At North Platte it forks, one branch being known as the South and the other as the North Platte. The Loup is the first large tributary. It rises among the sand-hills south of the Niobrara, in a group of small lakes. It has three main branches, known as the South, Middle, and North Loups, each of which in turn has many tributaries. The Middle Loup, whose main direction is southeast, is 250 miles long. The Elkhorn, which empties into the Platte a short distance above the latter's junction with the Missouri, is one of the most beautiful streams of the State. It too has its source in a region of small lakes near 99° 30' W. longitude. Here it has a remarkably broad bottom, with low bordering uplands. It flows over a rocky bottom in a southeasterly direction about 250 miles. Its principal tributaries are the North Fork and the Logan, the latter having an extraordinary number of tributaries. Near the south line of the State the Republican river and its numerous affluents drain a large area. It rises in the Colorado plains, but flows 216 miles through the State. Near the northern boundary is the Niobrara river, which rises in Wyoming, and flows 263 miles through the State before uniting with the Missouri. It is the most rapid and turbulent stream in the State. The most important of its numerous tributaries are the Keya Paha and the

Verdigris. Many other rivers in Nebraska are remarkable for the beauty and fertility of the sections which they drain, the most important being the Bows, the Big and Little Blue, the Great and Little Nemaha, and Salt Creek. The water-power of the State is enormous. Though the streams meander through broad bottoms, places can be found every few miles where the fall is from three to ten feet to the mile.

Nebraska is the meeting-place of two rather distinct floras—that of dry regions from the west, and their relatives from the moister east. Even many native Rocky Mountain plants have crept down to the plains of Nebraska. Of plants indigenous to the State 2,000 species have been collected; among these, 1,671 species are flowering plants. The *Composite* are represented by the largest number of species, there being 244 within the State. The sedges are represented by 151 species, though there are comparatively few individuals. The grasses are the leading vegetable forms in the number of individuals, though as yet only 147 species have been detected. Originally the short Buffalo grass was everywhere abundant, but it has almost entirely disappeared from the eastern half of the State and from large sections in its western portions, the taller blue-joint grasses taking its place. Nothing can surpass the beauty of the prairies during the summer season when covered with rank grasses and myriad flowers. Of forest trees seventy-one species are native. The leading variety in the number of individuals and forests is the cotton-wood (*Populus monilifera*), which grows luxuriantly on river bottoms and many uplands. The ash-leaved maple, soft maple, elms, various species of ash, lindens, and willows, are in various parts of the State about equal in abundance. The most valuable tree is the noble black walnut, which is extremely hardy and grows luxuriantly. The red cedar is abundant in some sections, and grows well everywhere. Two species of spruce and two of pine are found on tributaries of the Niobrara and Loup, and in the extreme western part of the State. Shrubs are represented by ninety-one species. Wild fruits abound, among which plums and grapes are most conspicuous, the former represented by three species and an endless number of varieties. The grapes are limited to timber belts, where they sometimes grow so luxuriantly as to make an almost impenetrable thicket of vines. The smaller wild fruits are widely distributed over the State.

Before the advent of the white man Nebraska was a paradise for wild animals—the buffalo, elk, deer, antelope, beaver, wolves, lynx, foxes, etc. The buffalo has been banished, but the rest are still found in the sparsely settled sections of the State. The bird fauna is well developed, being rich in genera (156); the species number at least 261. Many species of fish, molluscs, and a few reptiles are present in the streams.

No thick beds of coal have yet been discovered. The lower coal horizon is about 800 feet below the surface along the Missouri as far south as Richardson county, where the upper strata indicate a possible lower level geologically than is exposed elsewhere in the State. Thin beds of coal, from six to eighteen inches thick, are found near the surface in Cass, Otoe, Nemaha, Johnson, Pawnee, and Richardson counties; in the last occurs the best coal yet found in the State. At Aspinwall and on the State boundary it is twenty-four inches thick in places. In the southwestern part of the county a bed occurs from twenty to twenty-eight inches thick. This bed has been traced from east to west about twenty miles, and from north to south four miles. The coal is of good quality.

That the soils of the State are among the best in the world, chemical analysis and experience alike confirm.

Experience has not yet settled the question whether the alluvium of the valleys or the loess of the uplands is the more valuable. Grasses and corn (maize) are the principal products. Corn, especially, is a rarely failing crop. The root crops that grow in temperate latitudes thrive amazingly. Eastern Nebraska is eminently adapted to the growth of apples, which here attain a size, color, and flavor rarely equaled elsewhere. Grapes, plums, and cherries do equally well. Peaches, though not so sure as the former, are successfully grown south of the Platte. The strawberry nowhere reaches a better size or more luscious flavor than here. Other small fruits do almost equally well. The spontaneous growth of nutritious grasses, the ease with which cultivated varieties are grown, and the enormous yield of corn render the State peculiarly adapted for the raising of cattle, horses, sheep, and hogs. The stock industry is growing rapidly, and is at present doing most to enrich the people. No industry promises better results, however, than the planting of new forests, to which many people are devoting themselves with the most gratifying success.

The financial condition of the State is shown by the following statement: Total debt, \$1,727,510; annual charge, \$35,941.39; Gross revenue in 1899-1900 (two years), \$6,038,179; Gross disbursements, \$5,423,161; excess of revenue, \$615,018. The State school fund receipts were \$5,073,147, and the sinking fund \$123,000. Valuation, \$171,747,593; rate of tax, 6.25 mills; population, 1,068,539; valuation per capita, \$176.01; tax per capita, \$1.33.

The following gives the number and valuation of various farm animals, etc., together with the acreage in farms and total value of farm property: Improved and unimproved land, 29,911,779 acres, total value of farm property, \$747,950,057; horses, 795,318, value, \$36,663,359; dairy cows, 512,544, value, \$17,192,120; other neat cattle, 2,663,699, value, \$65,277,378; mules and asses, 55,856, value, \$3,288,216; sheep and lambs, 511,273, value \$1,678,498; swine, 4,128,000, value, \$18,660,932.

The following gives the total figures for various farm produce for the year 1899 together with number of fruit trees in State: corn, 210,974,740 bushels; wheat, 24,924,520 bushels; oats, 58,007,140 bushels; barley, 2,034,910 bushels; rye, 1,901,820 bushels; buckwheat, 8,629 bushels; flaxseed, 54,394 bushels; grass seed, 41,826 bushels; potatoes, 7,817,438 bushels; broom corn, 2,733,290 pounds; hay and forage, 3,517,495 tons; trees, fruit, 6,240,118.

By the completion of the Union Pacific Railroad in 1869 a highway was made to the Pacific across Nebraska. The Burlington and Missouri River Railroad, begun in the same year, was completed to its junction with the Union Pacific at Kearney in 1872. It extended its main line during 1882 through the Republican valley to Denver, Col. In connection with both these main lines there are important branches; and in 1900 over 5,600 miles of railway had been constructed in the State. Before the Union Pacific was made, freighting across the plains was a large and profitable business. Omaha was conspicuous for its energy in securing this traffic, and grew to be the first city in Nebraska, and has ever since led the State in commerce and in manufacturing enterprises.

A basis for a free-school system was laid by Congress in the act constituting Nebraska a Territory, by which two sections of land (1,280 acres) in each township were set aside for this purpose. The State constitution of 1875 provided that all fines, penalties, and license moneys arising under the general laws of the State should be transferred to the school fund, and that the legislature should provide for the free instruction in the common schools of the State of all persons between the

ages of five and twenty-one years. The census of 1880 shows that only 2.5 per cent. of the population of Nebraska over ten years of age are unable to read—a smaller proportion of illiteracy than that of any State in the Union, with one exception, (Iowa, 2.4 per cent.)

By act of the legislature, approved June 14, 1867, a commission was appointed to locate the seat of government on any lands belonging to the State, lying either in Seward county, the south half of either Saunders or Butler county, or in that part of Lancaster county lying north of the south line of township 9 north, such location and seat of government to be called "Lincoln." The commission selected the present site of this city, then called "Lancaster," and secured to the State, from the residents of that village and vicinity, a donation of 800 acres of adjoining lands. These lands were platted, lots sold, and a part of the proceeds used in erecting the old capitol building at a cost of nearly \$85,000. By legislative authority this old building was sold for \$300, the purchaser agreeing to remove it from the site of the present "main building." The contract price for the new State-house, completed, is \$639,687.25, of which amount \$25,500 have been paid from proceeds of State lots. Contract price for improving grounds, \$57,200, which amount is to be paid out of sale of State lots.

By act of Congress, fifty sections of land were donated to the State for the erection of suitable buildings for a State prison. The commission to locate the seat of government for the State was, by the same act of the legislature, directed to locate the penitentiary of the State in Lincoln. From the records, it appears that the prison buildings and inclosing walls have cost the State \$435,391.

By act of the legislature, approved February 16, 1869, the governor, the state auditor, and the secretary of state were appointed a "commission to locate, on or near the town site of Lincoln, a site for a lunatic asylum," and they were also authorized to erect suitable buildings thereon. A building was erected on the selected site. This building was destroyed by fire, and was rebuilt. To this have been added, at different times, under several contracts, five wings or additions to the main building, kitchen, boiler-house, barn and other buildings and permanent improvements, amounting in the aggregate to \$272,413. The asylum has also other property, estimated to be worth \$70,668.05.

By act of February 22, 1875, \$10,000 were appropriated for the purpose of erecting and furnishing a building for a school for the blind, whenever the people of Nebraska City should raise and pay into the hands of the trustees for such school the sum of \$3,000 in money or property. The site to be selected by said trustees was to be within one mile of the courthouse in said city. Ten acres of land were thus secured for the school where now located, and a two-story brick with basement erected. To this have been added other buildings and improvements at an aggregate cost of \$67,888, including the first \$10,000 appropriated.

By act of the legislature of the Territory of Nebraska, Aurelius Bowen, E. H. Rogers, John S. Bowen, G. C. Monell and John McPherson were declared a body corporate under the name of the "Institute for the Deaf and Dumb." This act fixes the location of the institute at Omaha, or within three miles of the courthouse. The institute owns twenty-three acres of land and buildings and permanent improvements that have cost the State \$96,500. The superintendent estimates the value of other school property at \$22,484.

The legislature, act of February 27, 1879, established the "Nebraska State Reform School for Juvenile Offenders," to be located at or near Kearney. The land was secured and the \$10,000 appropriated by said

act used in erecting a main or official building. To this have been added five family buildings, workshop, barn, and other permanent improvements till the whole has now cost the State \$145,950.

Pursuant to act of the legislature of March 4, 1885, 320 acres of land were deeded to the State by the people of Norfolk in consideration of the location of an Insane Asylum within three miles of said city. The \$75,000 appropriated were expended in erecting a three-story brick, with basement, and by authority of subsequent legislation two wings, boiler-house, engine-house, laundry, barn, and other improvements have been made at a cost of \$96,200, making the present plant cost \$171,200.

By act of legislature approved March 5, 1885, the "Nebraska Institute for Feeble-Minded Youth" was established, and \$50,000 appropriated to erect and furnish suitable buildings at or near Beatrice. To this have been added improvements, making a total cost to the State, to date, of \$71,239.

The legislature, act of February 28, 1881, established a Home for the Friendless. Lincoln secured the location. The property has cost the State \$28,895.30. Other property, \$5,988.80.

By act of March 4, 1887, a Nebraska Soldiers' and Sailors' Home was established at Grand Island. Land was secured, and the \$30,000 appropriated by the act expended in erecting suitable buildings. Furniture and other necessary articles have been purchased by the superintendent to the amount of about \$3,000. The number of inmates, November 30, 1888, was thirty-three.

In 1900 the number of children of school age was 372,764; the number enrolled in the public schools 277,765; and the average attendance 146,139. There were 6,710 school-houses, 19,192 teachers, receiving an aggregate salary of \$2,498,766. In 1901-02 there were 2,256 students in the State University, of whom over 1,000 were women.

The chief towns of the State are Omaha (pop. 102,555), So. Omaha (26,001), Lincoln (40,169).

History.—Nebraska was probably first visited by Europeans in 1541, in July of which year the Spanish general and explorer Coronado penetrated from New Mexico to a country which he called Quivira, and described as lying about the fortieth parallel, and abounding in buffalo, which corresponds with the region of the Platte. It was then occupied by powerful Indian tribes, whose chief ruler was Tatarax. It was subsequently revisited by Padilla, a Franciscan friar who had accompanied Coronado, and who here lost his life. No more records of visits to this region are chronicled for 200 years. About the middle of the eighteenth century French missionaries from Canada came to the Missouri, and still later a few traders found their way here. It constituted a portion of the Louisiana territory which was purchased by Jefferson from France in 1803. At that time Indian tribes still occupied the whole region. At some earlier period a more civilized race lived here who made pottery and skillful carvings, built houses and fortifications, and reared mounds which often contain the ashes of their dead. When Nebraska came into possession of the United States the Sioux Indians were most numerous. The Pawnees, Otoes, and Omahas were next in numbers and in importance. These powerful tribes have all become reduced in numbers by disease, constant wars, and privations. The Sioux, who early gained the ascendancy over the other tribes, resided in northeastern Nebraska. The eastern part of the South Platte region was occupied by the Otoes, and the western part by the Pawnees, between which tribes there were constant boundary disputes.

The first settlement by whites was made in 1847 at Bellevue, on the Missouri, nine miles south of Omaha. Here a trading post of the American Fur Company was conducted by Col. Peter A. Sarpy, a Frenchman distinguished by his knowledge of the Indians, his courage and his enterprise. The Mormon emigration, begun in 1847, traversed several paths, one of which lay through Nebraska, which thus became generally known throughout the country. During the overland traffic to California that commenced in 1849, depots of supply were established at Bellevue, Plattsmouth, Nebraska City, and in the interior of Fort Kearney.

The act constituting Nebraska a distinct Territory, and opening its lands to settlement, was approved May 30, 1854. Its area then embraced 351,558 square miles, extending from the fortieth parallel to British America on the north, its eastern line connecting the Missouri river on the southeast with the Red River on the north, and its western line being the summit of the Rocky Mountains. In 1861 Nebraska was shorn of its extended territory by the cutting off of portions of it to form Dakota and Colorado Territories. In 1863 it was still further reduced by the formation of Idaho Territory. These curtailments left Nebraska a purely prairie State. During the first five years after the organization of the Territory the settlements rapidly increased along the Missouri. Great numbers who rushed to Pike's Peak in 1859 when the gold excitement was at its height, on their return, disappointed and disgusted, stopped and opened farms in the State. This had the effect of starting settlements in the interior. The bottom-lands of the Missouri and its tributaries had first been occupied, and it was supposed that the uplands were of inferior fertility. Now, however, these so-called "bluff-lands," composed of loess materials, began to be cultivated, cautiously at first, until experiment proved them to be of the choicest character. Pioneers then began to push out from the rivers, at first only a few miles, but finally wherever lands could be obtained, without regard to the presence or absence of bottom-lands. In 1863 the Union Pacific Railroad and in 1864 the Burlington and Missouri River Railroad began to sell portions of their lands in Nebraska, received from the general government; and this became a most potent factor in turning a tide of emigration into the State.

At the breaking out of the civil war in 1861 the population of the Territory comprised less than 30,000. Yet Nebraska furnished to the Union army during the war 3,307 officers and men. The United States census of 1900 gave Nebraska a population of 1,068,539.

In 1866 the legislature prepared a constitution for a State government, which a vote of the people confirmed by a small majority, though the opponents of the measure claimed that it was obtained by fraud. The first legislature under the State constitution met July 4, 1866. The bill to admit Nebraska as a State was passed over the president's veto, and proclaimed on March 1, 1867.

The first capital of Nebraska was at Bellevue. It was removed to Omaha in 1855, where it remained until Nebraska became a State, when it was taken to Lancaster, a town of half a dozen houses, whose name was then changed to Lincoln. The present State constitution was framed in 1875, and was ratified in the same year by the people. The first legislature under the new constitution met in January, 1877. The house of representatives consists of eighty-four, and the senate of thirty members; and the legislature meets biennially.

NEBRASKA CITY, a town in Nebraska in Otoe county, of which it is the capital, is situated on the

Missouri river, on its western bank. It is an important railroad center, and contains, among other educational institutions, the Nebraska College, also a courthouse, two public halls, twelve churches, several national banks and two high schools, several flour-mills, a foundry, machine-shop, tannery, manufactories of cigars, beer, bricks, carriages, plows, soap, etc. Several newspapers are published here. The city is lighted with gas. Population, 1900, 7,380.

NEBUCHADNEZZAR is the familiar form of the name of the great Babylonian king who carried the Jews captive, and whose reign marks the highest point of the Chaldean empire. To what has been said of Nebuchadnezzar in the article BABYLONIA (comp. DANIEL and ISRAEL) it may be added that a fragment of a cylinder with an inscription relating to a war with Egypt in the thirty-seventh year of his reign has been published by Schrader, that an inscription of Nebuchadnezzar has been observed by Sayce on the north bank of Nahr al-Kalb near Beyrût, and that two large inscriptions have also been found by Pognon in Wâdi Brissa, near Hermel, in the Lebanon.

NEBULA. See ASTRONOMY.

NEBULAR THEORY. The nebular theory is a famous hypothesis which has been advanced with the view of accounting for the origin of the solar system. It is emphatically a speculation; it cannot be demonstrated by observation or established by mathematical calculation.

There are very remarkable features in the solar system which point unmistakably to some common origin of many of the different bodies which it contains. We must at once put the comets out of view. It does not appear that they bear any testimony on either side of the question. But even with this omission we still muster in the solar system from two to three hundred bodies, almost every one of which pronounces distinctly, though with varying emphasis, in favor of the nebular theory. The first great fact to which we refer is the common direction in which the planets revolve around the sun. If the direction of movement were merely decided by chance, the probability against such an arrangement is of stupendous magnitude. It is represented by the ratio of unity to a number containing about sixty figures, and so we are at once forced to the conclusion that this remarkable feature of the planetary motions must have some physical explanation. In a minor degree this conclusion is strengthened by observing the satellites. Discarding those of Uranus, in which the orbits of the satellites are highly inclined to the ecliptic, and in which manifestly some exceptional though unknown influences have been at work, we may say that the satellites revolve around the primaries also in the same direction; while, to make the picture complete, we find that the planets, so far as they can be observed, rotate on their axes in the same manner.

The nebular theory here steps in and offers an explanation of this most remarkable uniformity. Laplace supposed that our sun had once a stupendous nebulous atmosphere which extended so far out as to fill all the space at present occupied by the planets. This gigantic nebulous mass, of which the sun was only the central and somewhat more condensed portion, is supposed to have had a movement of rotation on its axis. There is no difficulty in conceiving how a nebula, quite independently of any internal motion of its parts, shall also have had as a whole a movement of rotation. In fact a little consideration will show from the law of probabilities that it is infinitely probable that such an object should really have some movement of rotation, no matter by what cause the nebula may have originated. As this vast mass cooled it must by the laws of heat have con-

tracted toward the center, and as it contracted it must, according to a well-known law of dynamics, rotate more rapidly. The time would then come when the centrifugal force on the outer parts of the mass would more than counterbalance the attraction of the center, and thus we would have the outer parts left as a ring. The inner portion would still continue to contract, the same process would be repeated, and thus a second ring would be formed. We have thus grounds for believing that the original nebula would separate into a series of rings all revolving in the same direction with a central nebulous mass in the interior. The materials of each ring would continue to cool and to contract until they passed from the gaseous to the liquid condition. If the consolidation took place with comparative uniformity we might then anticipate the formation of a vast multitude of small planets such as those we actually do find in the region between the orbit of Mars and that of Jupiter. More usually, however, the ring might be expected not to be uniform, and therefore to condense in some parts more rapidly than in others. The effect of such contraction would be to draw into a single mass the materials of the ring, and thus we would have a planet formed, while the satellites of that planet would be developed from the still nascent planet in the same way as the planet itself originated from the sun. In this way we account most simply for the uniformity in the direction in which the planets revolve, and for the mutual proximity of the planes in which their orbits are contained. The rotation of the planets on their axes is also explained, for at the time of the first formation of the planet it must have participated in the rotation of the whole nebula, and by the subsequent contraction of the planet the speed with which the rotation was performed must have been accelerated.

NECHO, the Biblical form (2 Kings xxiii. 29; Jer. xli. 2) of the name Neku. (See EGYPT and ISRAEL.)

NECKER, JACQUES, finance minister of Louis XVI., and convener of the states-general of 1789, was born at Geneva in 1732. He became a syndic or director of the French East India Company, and, after showing his financial ability in its management, defended it in an able memoir against the attacks of Morellet in 1769. He had also made interest with the French Government by lending it money, and in October, 1776, was made finance minister of France. He did great good in regulating the finances by attempting to divide the *taille* or poll-tax more equally, by abolishing the "vingtième d'industrie," and establishing "monts du piété." In 1781 he published his famous *Compte Rendu*, in which he drew the balance-sheet of France, and was dismissed from his office. In 1788 the country, which had come to believe that Necker was the only minister who could "stop the deficit," as they said, demanded Necker's recall, and in September, 1788, he became once more director-general of the finances. Throughout the early months of 1789 Necker was regarded as the savior of France. He was nevertheless regarded as the cause of the Revolution by the court, and on July 11th, while at dinner, received the abrupt order to leave France at once. But Necker's dismissal brought about the taking of the Bastille, which induced the king to recall his old minister. His return was an absolute ovation. His popularity vanished when his only idea was to ask the assembly for new loans, and in September, 1790, he resigned his office, unregretted by a single Frenchman. Not without difficulty he reached Coppet, near Geneva, an estate he had bought in 1784. Here he occupied himself with literature. He died at Coppet in April, 1804.

NECROSIS. This word, which has the same meaning as mortification, is now restricted in surgical works

to death of bone. It is sometimes used to signify the part which dies; it may, however, with more propriety signify the process, ending in the death of the bone. A severe inflammation, caused by a severe blow, by cold, or by the absorption of various poisons, as mercury and phosphorus, is the general precursor of necrosis.

NECTAR AND AMBROSIA are the nourishment of the gods in Homer and in Greek literature generally.

NECTARINE, a fruit differing from the peach in having a smooth or glabrous skin instead of a downy one. The varieties of nectarine, too, have often a distinct flavor from that of the peaches. The common origin of the peach and nectarine is shown, however, by the facts that seeds of the one will often reproduce the other, and that fruits of both kinds have not infrequently been met with on the same branch.

NEEDLE. The sewing needle is an implement which has been in use from prehistoric times in all places where mankind used the skins of animals or woven fabrics for clothing. Originally the needle was made of fishbone, bone, or ivory, and its first form was probably a rude eyeless bodkin. Needles of bone continue to this day to be used by uncivilized tribes; but since the time of the discovery of bronze metal needles have been in use in civilized communities. It is on record that needles of steel were made at Nuremberg toward the end of the fourteenth century, and at a later period Spanish needles acquired wide celebrity. For upward of two centuries the manufacture has been established in England—Redditch in Worcestershire, with several other small towns in Warwickshire, being the center of the industry, first planted there by Germans. Originally the trade was domestic in its character, but now it is carried on in large manufactories where mechanical appliances have to a certain extent supplanted handiwork, with much advantage to the health and the well-being of the operatives.

The raw material of the manufacture consists of steel wire of fine quality and suitable gauge. The wire is supplied in coils of definite weight and diameter, and the first operation consists in cutting the coil with powerful shears. With the aid of a gauge the coil is cut with precision into lengths, each sufficient for two needles. The lengths, having the curvature of the coil and other inequalities, are next straightened. For this purpose a bundle containing several thousand lengths is packed within two strong iron rings; the bundle is heated to red heat, and then pressed on an iron plate having two parallel grooves in which the iron rings run. Over this plate the bundle is worked backward and forward by the pressure of an oblong slightly-curved iron tool having two longitudinal slits through which the edges of the rings project. Thus by combined pressure and rolling the whole of the lengths quickly become perfectly straight and even. The next operation consists in pointing both ends of the wires, which, being done on a dry grindstone, revolving at high speed, is, from the sparks and dust created, very injurious to the operatives. A grinder, holding at one time several dozen wires against the stone with his left hand, and revolving them slightly with his right, will point about 100,000 needles in a day. He is but imperfectly protected against the deadly dust he produces by a cowl which, partly covering the grindstone, is connected with a pipe through which a strong current of air is drawn, sucking away a large proportion of the dust. For the operation of pointing various machines have come into extensive use, especially in Germany. In general principle these machines consist of a wheel, to the periphery of which the wires to be pointed are held by an india-rubber band. It revolves at right angles to the revolving hollow grindstone, and, bringing each wire in rapid succession at the

proper angle for grinding against the stone, it points three times as many as a skillful grinder. The succeeding series of operations have for their object the eyeing of the needles. As a preliminary to this the oxidized scale at the center of the wire is ground off, and on the surface so prepared each wire is separately stamped, by means of dies, with the grooved and rounded impression of two needle heads set end to end. Through these stamped heads the eyeholes are next perforated by means of a screw-press working a pair of fine steel punches or prongs. Each wire now forms two needles attached head to head by a broad thin scarf of steel at the point of junction where the metal has been stamped for the head. The double needles, taken to the number of about one hundred, are threaded together with a fine wire passed through the eyes, giving the whole the appearance of a fine close-set comb. Each side is clamped up tightly, and the expansion of the scarf in the center is removed by a file. The spitted row is now ready to break over into separate needles, and as the point of junction of the two sets of heads is weakened by the stamping process, the rows readily break at that point by bending. These heads are then smoothed and rounded with the file before the clamp is removed, the wire withdrawn, and the separate needles set free. At this stage the needles are hardened and tempered in the usual manner; that is, they are placed in an iron tray, heated to redness in a muffle furnace, plunged into an oil bath, then re-heated in the muffle till they assume a straw color, and gradually cooled. Following the tempering comes the process of scouring and fining or polishing, for which purpose the needles are put up in bundles of several thousands mixed with soft soap, oil, and emery powder, and tied tightly round with a canvas cover. A number of such bundles are laid in the bed of a machine in which by rollers or other devices they are kept rolling backward and forward, so that each individual needle rubs against its neighbors. After sufficient time the bundles are withdrawn, the needles cleaned by washing, dried, and again bunched up as before, but with a mixture containing putty powder in place of emery. The rolling process is continued till the needles acquire a sufficiently polished surface. The needles are now unpacked, washed in an alkaline solution, and dried in sawdust. From that they are conveyed to trays, where they are brought parallel to each other by a sharp jerking motion. It is next necessary to bring all the heads in one direction, which is dexterously done by a "header," who with a cloth finger-stool on the fourth finger presses a lot of needles against that cloth. Points presented adhere, and thus at each operation a number of needles remain sticking in the finger-stool. While this arrangement is going on, faulty and imperfect needles are picked out. The heads being all now laid in one direction, attention is given to the smoothing and rounding of the eyeholes, a work essential for the prevention of the fraying and breaking of the thread in sewing. The heads are blued by heating, an operation most neatly and perfectly performed by bringing each head in succession in contact with a gas flame by means of a revolving wheel, against the periphery of which the needles are retained by an elastic band. The needles so glued are strung on a roughened steel wire, over which is spread a fine paste of oil and emery. These wires are suspended between uprights on a frame platform, to which a jerking motion is communicated; thereby an oscillating motion is communicated to the suspended needles, and the gentle friction thus set up between the needle eye and the roughened wire and emery slowly but effectually secures the desired effect. Now it only remains to free the head from the blue color on a small grindstone, and

give a final polish to the needle on a rapidly revolving buff wheel aided by putty powder. It has of late become a common practice to gild the heads of needles. The variety of needles manufactured for sewing by hand and machine, for packing, for upholstery and leather work, as well as for surgical purposes, is very great, and demands many modifications of processes and appliances.

NEER, VAN DER. Aernout and Eglon van der Neer, father and son, were painters in the seventeenth century.

NEENAH, a city of Winnebago county, Wis., is situated on the Fox river, thirty miles north of Fond du Lac, with which it has steamboat connection. The water power is used to operate flouring and paper mills. Neenah has also many sawmills, manufactories of sash, door and blinds, staves, etc., and a pop. (1900) of 5,954.

NEES VON ESENBECK, CHRISTIAN GOTTFRIED, botanist and entomologist, was born at Erbach on February 14, 1776. He died in 1858.

NEGAPATAM, a town and the chief port of Tanjore district, Madras, India. Pop. (1901), 56,455.

NEGAUNEE, a town in Michigan, in Marquette county, lies at the junction of the Marquette, Houghton and Ontonagan railroad, with the Chicago and North-Western. It is in the midst of a rich iron country, and very large capital is here invested in iron mines. The town has several large blast furnaces, national banks, newspaper offices, three churches, manufactories of mining powder and other explosives. Population in 1900, 6,935.

NEGLECT is in one aspect the correlative of diligence (see DILIGENCE), in another of intention. It is the absence of diligence or the absence of intention. All definitions imply this. Negligence is a term difficult to define for more than one reason. It is used not only to denote a mental state, but the consequences resulting from a mental state. Again, the term bears a somewhat different meaning as applied to civil or criminal liability. The meaning of negligence, in the common use of language, is very general and indefinite. It is practically synonymous with heedlessness or carelessness, not taking notice of matters relevant to the business in hand, of which notice might and ought to have been taken. This meaning is no doubt included in the legal sense of the word, but in reference to criminal law the word has also the wider meaning of omitting, for whatever reason, to discharge a legal duty, *e.g.*, the omission by a medical man to exercise that skill which it is his duty to exercise. The vagueness of the standard by which negligence is tested is another and more serious practical difficulty. The standard is the average prudent action of the average citizen, and the defendant fails to reach this standard at his peril. This is the standard implied by such definitions as that of the New York Penal Code, "the terms 'neglect,' 'negligence,' 'negligent,' and 'negligently' * * * import a want of such attention to the nature or probable consequences of the act or omission as a prudent man ordinarily bestows in acting in his own concerns," and that of Sirey (*Code Pénal*, § 319), "the omission or forgetfulness of a precaution dictated by prudence." The connection between negligence and intention is illustrated by a passage in the judgment of Baron Alderson in *Blyth v. The Birmingham Water Works Company* (1856). "The definition of negligence," says that learned judge, "is the omitting to do something that a reasonable man would do, or the doing something that a reasonable man would not do; and an action may be brought if thereby mischief is caused to a third party not intentionally." The intention is of great importance in criminal law. Thus as a general rule it may

be said that what is manslaughter where there is negligence becomes murder where there is intention. But the negligence may in some cases be of such a nature as to lead to the presumption of legal malice. In the same way in cases where the liability is civil it is important to notice that the phenomena of negligence often accord closely with those of intention. The phenomena of negligence and of dishonest intention may be similar to such an extent that the court may regard them as the same, since the legal consequences resulting from them are the same.

NÉGRO (Spanish and Italian *Negro*, from Latin *Niger*, black) in anthropology designates the distinctly dark as opposed to the fair, yellow, and brown varieties of mankind. In this its widest sense it embraces all the dark races, whose original home are the inter-tropical and sub-tropical regions of the eastern hemisphere, stretching roughly from Senegambia, West Africa, to the Fiji Archipelago, Pacific Ocean, west and east, and lying north and south between the extreme parallels of the Philippines and Tasmania. The Negro domain thus originally comprised all Africa south of the Sahara, India south of the Indo-Gangetic plains, Malaysia, and the greater part of Australasia. But this domain has since prehistoric times been intruded upon in the east mainly by peoples of the yellow Mongoloid, in the west mainly by peoples of the fair Caucasian stock. During the early and middle Tertiary epochs it appears also to have been gradually broken into two great divisions—by the subsidence of lands, some suppose, which are now flooded by the waters of the Indian Ocean, and to which Sclater has given the name of Lemuria. To these two great eastern and western geographical divisions now correspond the two great ethnical divisions of the Negro stock—the Papuan or Melanesian of Malaysia and Australasia, and the Negro proper of the African mainland. During the long ages that have elapsed since this separation, the two branches, if originally one, have had time under diverse outward conditions to become differentiated into two sufficiently marked physical types, so that on strictly anthropological as well as geographical grounds it becomes convenient to deal separately with the Papuan and African divisions of the Negro family.

Owing to their peculiar qualities, great muscular development, and power of endurance in hot and moist lands, combined with a remarkable absence of personal self-respect, the African populations have from the remotest times supplied a chief material to the slave markets of the Old and New World. For thousands of years an incessant stream of black blood has been directed from the interior to the east coast and thence to Madagascar, Arabia, Persia, and even India, or down the Nile to Egypt and Asia Minor, or across the Sahara, to the Barbary States. Since the discovery of America hundreds of thousands have in the same way been shipped from the west coast for the West Indies, New Spain, the British and French plantations, and Brazil. Speaking generally, this black element has not amalgamated with the population of the eastern hemisphere, and has consequently left few traces of its presence anywhere except in Madagascar, where there may possibly have been an indigenous Negro people before the arrival of the intruding Hovas and other Malay tribes. Nevertheless a strain of Negro blood is apparent, not only among the Tuaregs and especially the Tibus of the Sahara, but also in Morocco, South Algeria, Egypt, the low-lying Teheima of the West Arabian seaboard, Makran, and even here and there along the coast of Malabar and Ceylon.

In some parts of America, notably the West Indian islands, the colored has actually replaced the indigenous

and largely absorbed the white element. Here we are altogether on firmer ground, and fairly accurate returns enable us to form an approximate estimate of the proportion of full-blood and half-caste Negroes in almost every part of the New World. On the other hand, the nomenclature of these mongrels has become so perplexing, and is often applied so irregularly, that it has led to many misconceptions on this point. Thus the term "Creole," applicable in Mexico only to persons of pure Spanish descent, denotes in Brazil, Peru, and elsewhere the presence of black blood in varying proportions. Of this bewildering nomenclature the chief terms are as under:—

Negro, African, Black: Full-blood Negro, whether born in Africa or of African descent.

Mulatto: Issue of black and white parents either way—a constant term in America.

Mestizo: Any half-breed, whether of white and Negro parents, or (more commonly in Spanish America) of white and Indian parents.

Creole: Mostly white of pure descent, but also blacks of pure descent (Brazil), the issue of whites and Mestizoes (Peru), and Mestizoes generally (Alaska). (In Louisiana and contiguous sections, the term Creole denotes a descendant of the original French or Spanish settlers.)

Zambo: Any half-breed, but mostly the issue of Negro and Indian parents; in the United States, Peru, and West Indies of Negro and Mulatto; in St. Vincent the half-caste Caribs.

Zambo Preto: Issue of Negro father and Zambo mother (Mexico and elsewhere).

Cholo: Issue of Zamboes (South America).

Pardo: Synonymous with Mulatto (Brazil); any Mestizo (Argentine States).

Mamaluco: Any Mestizo, but especially the issue of whites and Indians (Brazil).

Chino: Negro and Indian half-caste (Mexico, and generally in Spanish America).

Casco: Direct issue of *malattoes* on both sides (South America).

Tente en el Ayre: Mongrels in whom the white element predominates (South America).

Cafuso: Issue of Negro and Indian, dark shade and woolly hair predominating (Brazil).

Caburet: Issue of Negress and Indian (Brazil).

Cariboco, Tapanhuna, Xibaro: Local Brazilian terms of Tupi origin applied to various crosses between the Negroes and Indians.

The term *Mulatto* is applied to the offsprings of parents, one of whom is pure *Caucasian* and the other pure *African*; *Quadroons*, issue of *Mulatto* and white parents; *Octoroon*, the issue of *Quadroon* and white parents. The above is the nomenclature applied to mongrels in the United States.

NEGROPONT. See EUBŒA.

NEHEMIAH, governor of Judæa under Artaxerxes Longimanus. (See ISRAEL.) The book of Nehemiah is really part of the same work with the book of EZRA (*q.v.*), though it embodies certain memoirs of Nehemiah in which he writes in the first person. Apart from what is related in this book, we possess no trustworthy information about Nehemiah.

NEISSE, a well-built town and fortress of the first rank in the district of Oppeln, Prussian Silesia, lies at the junction of the Neisse and the Biela, and consists of the town proper on the right bank of the former river and the Friedrichstadt on the left. In 1900 the town contained 22,507 inhabitants, of whom 15,825 were Roman Catholics. The garrison forms about a fourth of the population.

NELEUS, a hero of Greek mythology, was son of

Poseidon by Tyro, daughter of Salmoneus, to whom the god appeared under the form of the Thessalian river-god Enipeus. Born in Thessaly, where his brother Pelias is king of Iolcus, Neleus becomes king of Pylus in Messenia and the ancestor of a royal family called the Neleids, who are historically traceable as the old ruling family in some of the Ionic states in Asia Minor. Tradition uniformly derives the Ionic colonies from the Attic coast, and the presence of the Neleids is explained by the legend that when the Dorians conquered the Peloponnesus the Neleids were driven out and took refuge in Attica, where they at once became kings of the land, and led colonies to the eastern shores of the Ægean. This race was obviously a maritime one, for there is no path except the sea between the widely separate shores where it can be traced, and its divine ancestor is Poseidon. Neleus was father by Chloris of Nestor, Pero, and other children. Through the contest for the hand of Pero he is connected with the legends of the prophetic race of the Melampodids, who founded the mysteries and expiatory rites and the orgies of Bacchus in Argolis.

NELLORE, a district in Madras presidency, India, with an area of 8,739 square miles. The population of Nellore in 1901 was 1,320,236, including 1,133,031 Hindus and 61,344 Mohammedans.

NELSON, a seaport of New Zealand, capital of a provincial district of the same name, prettily situated on the shores of a small harbor at the bottom of Blind Bay, on the northern coast of the South Island. It is a diocesan city, and contains several churches and a college. The climate is healthy, and the scenery picturesque. Area of district, 10,269 sq. m.; pop. (1901), 37,915.

NELSON, HORATIO NELSON, VISCOUNT, was younger son of the Rev. Edmund Nelson, and was born at Barnham, Thorpe, Norfolk, September 29, 1758. A love of adventure and a daring spirit, which developed itself from his earliest years, inclined the future admiral to the life of the sea, and, through the interest of a maternal uncle, the lad entered the navy in 1770. He was made a post-captain at the age of twenty-one, a promotion due to merit alone, and remarkable in that aristocratic age; and during the next few years he was actively engaged in the vicissitudes of the American War.

War between England and revolutionary France was declared in the first months of 1793; and Nelson, on the recommendation of Lord Hood—a veteran who held him in high esteem—was made captain of the *Agamemnon*, the first ship of the line commanded by him. He was dispatched under Hood to the Mediterranean; he took a prominent part in the siege of Bastia; and the capitulation of the place was due, for the most part, to their determined valor. At the siege of Cadiz also, where he lost an eye, he contributed largely to the result. In March, 1795, the British fleet under Admiral Hotham—Lord Hood had by this time been replaced—was partially engaged off the coasts of Italy with a French fleet of superior force; and a French eighty-four, having been dismasted, sheered off, towed by a powerful frigate, and supported by two large ships of the line. The *Agamemnon*, though only a sixty-four, stood out boldly after the retiring enemy; and Nelson's maneuvers were so skillful that he all but destroyed the crippled Frenchman, and kept the whole hostile squadron at bay, without incurring any serious loss. The injured ship, with one of her consorts, was easily captured a few hours afterward; and, had the admiral followed Nelson's advice, the whole French fleet would have been brought to action, and have probably met a complete defeat.

In the winter of 1795-96 Nelson was employed in

cutting off the supplies of the French army on the Italian seaboard. Soon after this he became a commodore; and before long he had again performed one of those great feats of daring and skill which ordinary commanders would have deemed impossible. Spain, drawn into her old alliance with France, had declared war in 1796; and on February 13, 1797, a Spanish fleet met one of the English, a few miles off Cape St. Vincent. Though the enemy had twenty-seven ships of the line, and the British force was only fifteen, its admiral, Jervis, did not hesitate; and, skillfully employing a well-known maneuver, he broke the hostile line, cutting off nine ships. The Spanish admiral, however, endeavored to rejoin this detachment by wheeling around his van; and the evolution might have been successful had not Nelson, placed at the British rear, immediately abandoned his own line, and, disregarding his superior's orders, assailed with his single ship the advancing squadron. This audacious movement threw him in the way of three first and three second rates; and, though the *Captain* was ably seconded by the three nearest ships of the British line, Nelson was engaged for more than half an hour with a force immeasurably superior to his own. Yet British discipline and valor triumphed; the Spanish commander drew off beaten, and the *Captain* boarded and took two ships, each larger and more powerful than herself, Nelson leading his exulting crew in person to the cry of "Westminster Abbey or Victory." For this extraordinary passage of arms Nelson received the order of the Bath and was made an admiral—his splendid success and skillful promptitude having effaced, even in professional minds, his disregard of the rules of the service. During the following months he was engaged in operations against Spain and her colonies; and he lost an arm in an attack on Santa Cruz, a place famous for one of Blake's victories. The time had now arrived when his genius and skill were to appear in full force in an independent command. In May, 1798, he was dispatched by Jervis—now Lord St. Vincent—to intercept a great French armament, which, under the guidance of Bonaparte, was intended to reach Egypt and to threaten India. His squadron, however, having been crippled in a gale, the hostile fleet escaped from Toulon and reached Alexandria on July 1st, the British admiral, who had made Aboukir on June 28th, having just missed it. This misadventure deceived Nelson, who believed that the enemy was still at sea; and it was not until he had made a circuit by Crete to the coasts of Sicily, and back again to the shores of Greece, that he heard how the French had made good their landing. He set off from the Gulf of Coron, though his intelligence was a rumor only; and on August 1st the enemy was descried. His plan of attack was quickly formed, and it was marked by his wonted insight and skill. The French fleet lay in front of the roads of Aboukir, the rear supported by coast batteries, the center and van more out at sea, but composed of new and formidable ships; and, as shoals stretched between it and the neighboring shore, its admiral, Brueys, believed that no foe would thread the way between and attack from that side. Nelson, however, a dexterous pilot from boyhood, saw that with fine steering the feat was possible; and he directed part of his fleet to assail the enemy to the landward through this intricate passage, while the remaining part assailed from the seaward. As evening fell his preparations were complete; the shoal stopped only one of the British ships, and before an hour had passed his divided line had encompassed more than half the French fleet. The issue of the battle was never doubtful; the French, indeed, fought with heroic courage, but their rear and center, placed between two fires,

were gradually overpowered and destroyed; and their van, at anchor, like all their line, was either unable or perhaps unwilling to make sail and assist their consorts. The flagship of Brueys, the huge *Orient*, blew up toward midnight in a volcano of flame, and by daybreak on the 2d the victory was complete.

The victory of Marengo, won by Bonaparte after his extraordinary return from Egypt, having broken up the coalition against France, and inclined the czar to a French alliance, the Northern courts, with Denmark at their head, renewed the armed neutrality of 1780; and, in the first months of 1801, a British fleet was fitted out for the Baltic to put an end to this menacing league. Sir Peter Parker, a cautious veteran, was made chief of this expedition, Nelson being only the second in command. Copenhagen was covered by strong batteries; and an imposing array of heavily armed craft, protected by a shoal as was the case at Aboukir, presented a most formidable line of defense. Nelson, however, declared for an immediate attack; and on May 2d, the attempt was made, Parker having judiciously left him to act for himself. The result was that, although his squadron destroyed the first line of the Danish defenses, and threatened the capital with ruinous injury, the hostile batteries were not silenced, and Nelson's ships had suffered so much that he readily welcomed the terms of a truce which extricated him from no little danger. Parker, indeed, had been so alarmed at the prospect that he had actually signaled the fleet to retreat; but Nelson characteristically refused to obey until something like victory had been attained—on the whole, certainly, a wise resolve.

Nelson was made a viscount for Copenhagen, and the league of the North was soon dissolved, for, though his success had not been perfect, it had taught the enemy a severe lesson. During the summer of 1801 he was engaged in watching the first preparations for a descent on the English coast, already contemplated by Napoleon; and on the renewal of the war in 1803 Nelson was appointed to the Mediterranean command. He took up his station off Toulon; and for nearly two years he kept the French in port. At last at the end of March, 1805, the French admiral, Villeneuve, escaped from Toulon—his mission being to rally a Spanish squadron, to cross the Atlantic and reach the West Indies, and then, returning to the seas of Europe, to liberate the French and Spanish squadrons blockaded at Ferrol, Rochefort, and Brest, and to attain the Channel with a great armada of from fifty to sixty ships of the line.

By October 20th Villeneuve had put to sea with the combined fleets of France and Spain. Nelson, eager to decoy the Frenchman out, had kept a considerable distance from land. By daybreak on the 21st the fleet of Villeneuve was descried off the Cape of Trafalgar; and the English fleet was formed into two columns, the northern led by Nelson in the *Victory*, the southern under Collingwood in the *Royal Sovereign*. Villeneuve, a skillful seaman though a timid leader, had arranged his squadrons ably to meet the attack.

Six or seven ships of the French and Spanish first line made a stern and noble resistance; but the second line gradually fell to leeward; the van, as at the Nile, scarcely fired a shot; and, divided, scattered, and overpowered at every point where the defense was maintained, the allied fleet ere long was a mass of fragments, disabled, helpless, and pursued by their conquerors. Nevertheless the victory, splendid as it was, was dearly bought by the loss of the life of the illustrious warrior who had prepared it. A musket ball from the *Redoubtable's* tops inflicted a mortal wound on Nelson about an hour after the battle began, and he died toward evening, to the unspeakable grief of all who

witnessed the sorrowful scene in the *Victory*. He retained, however, his great faculties to the last; he lived to hear that almost two-thirds of the enemy's fleet had been destroyed or captured; and, though he passed away in the prime of manhood, it can hardly be said that his death was premature, for the foes of England had been swept from the ocean.

NELSONVILLE, a post-village in Athens county, Ohio, lies on the Hocking river, sixty-two miles southeast of Columbus. Coal-mining is the principal business of the place. It contains a bank, three churches, newspaper offices, has railroad and telegraph connections, and a population in 1900 of 5,421.

NEMATOIDEA. The name *Nematoidea* was first introduced by Rudolphi, but the group had been previously recognized as distinct by Zeder under the name of *Ascarides*. They are now by many systematists united with the *Acanthocephali* to form the order *Nemathelminthes*.

The *Nematoidea* possess an elongated and thread-like form varying in length from a few lines up to several feet. The body is covered externally by a chitinous cuticle which is a product of the sub-jacent epidermic layer; this cuticle is frequently prolonged into spines and papillæ, which are especially developed at the anterior end of the body. The mouth opens at the one extremity of the body and the anus at or near the other. Beneath the epidermis is a longitudinal layer of muscle-fibers which are separated into four distinct groups by the dorsal, ventral, and lateral areas; these are occupied by a continuation of the epidermic layer; in the lateral areas run two thin-walled tubes with clear contents, which unite in the anterior part of the body and open by a pore situated on the ventral area. These vessels are considered to represent the segmental organs of other worms. The lateral areas are entirely absent in *Gordius*. The body cavity is largely occupied by connective tissue, and neither here nor elsewhere are cilia found at any period of development. The alimentary tract consists of a straight tube running from the mouth to the anus without any convolutions; it is separable into three divisions—(1) a muscular œsophagus, which is often provided with cuticular teeth; (2) a cellular intestine; and (3) a short terminal rectum surrounded by muscular fibers.

NEMEAN GAMES. See GAMES.

NEMERTINES, or NEMERTEANS (*Nemertea*), is the name of a subdivision of worms, characterized by the ciliation of the skin, by the presence of a retractile proboscis, by the simple arrangement of the generative apparatus, and in certain cases by a peculiar pelagic larval stage to which the name "pilidium" has been given. Many of them are long thread-shaped or ribbon-shaped animals, more or less cylindrical in transverse section. Even the comparatively shortest species and genera can always be termed elongate, the broadest and shortest of all being the parasitic *Malacobdella* and the pelagic *Pelagoneurtes*. There are no exterior appendages of any kind. The colors are often very bright and varied. They live in the sea, some being common among the corals and algæ, others hiding in the muddy or sandy bottom, and secreting gelatinous tubes which ensheath the body along its whole length.

NEMESIANUS, a Roman poet who flourished about 283 A.D. His full name was Marcus Aurelius Nemesianus Olympius, and he is called a Carthaginian. He was an admired and popular poet at the court of the Roman emperor Caius.

NEMESIS occasionally appears as a Greek goddess. At Rhamnus in Attica she had a famous temple, and there was an Attic legend that Helen was the daughter of Nemesis. The Attic goddess was perhaps a form of

Aphrodite, who sometimes bears the epithet Nemesis. In Smyrna and the neighboring Temnos we find a pair of goddesses of the name.

NEMESIUS, a Christian philosopher, author of a treatise *On Human Nature*, was, according to the title of his book, bishop of Emesa (in Syria); of his life nothing further is known, and even his date is uncertain, but most probably he flourished toward the close of the fourth century.

NENAGH, a market and assize town of County Tipperary, province of Munster, Ireland, is finely situated in a rich though hilly country near the river Nenagh, twenty-nine miles north of Tipperary and ninety-five southwest of Dublin.

NENNIUS, the supposed author of a *Historia Britonum*, which, commencing with a description of Britain, gives the mythical origin of the Britons and Scots and an account of the Roman occupation and of the reign of Vortigern, describes the successive settlements of the Saxons, and concludes with a narrative of the twelve battles in which King Arthur, in the sixth century, is said to have defeated the Saxons. The work is evidently the production of a Cymric or ancient Welsh writer.

NEOPHYTE was the designation applied to newly baptized persons in the ancient church.

NEOPLATONISM. *Historical Position and Significance*.—The political history of the ancient world closes with the formation, under Diocletian and Constantine, of a universal state bearing the cast of Oriental as well as Græco-Roman civilization. The history of ancient philosophy ends in like manner with a universal philosophy which appropriated elements of almost all the earlier systems, and worked up the results of Eastern and Western culture. And, just as the Byzantine Roman empire was at once the supreme effort of the old world and the outcome of its exhaustion, so Neoplatonism is in one aspect the consummation, in another the collapse, of ancient philosophy. Judged from the standpoint of pure science, or the empirical investigation of the universe, philosophy passed its meridian in Plato and Aristotle, declined in the post-Aristotelian systems, and set in the darkness of Neoplatonism. But, from the religious and moral point of view, it must be affirmed that the ethical "mood" which Neoplatonism endeavored to create and maintain is the highest and purest ever reached by antiquity.

It is a proof of the strength of the moral instincts of mankind that the only phase of culture which we can survey in all its stages from beginning to end culminated, not in materialism, but in the boldest idealism. This idealism, however, is also in its way a mark of intellectual bankruptcy. Contempt for reason and science leads in the end to barbarism—its necessary consequence being the rudest superstition, and sheer helplessness in the presence of all sorts of delusion. As a matter of fact, barbarism did break out after the flower had fallen from Neoplatonism. By a fortunate coincidence, at the very moment when this bankruptcy of the old culture—its reversion to barbarism—must have become apparent, the stage of history was occupied by barbaric peoples, with whom the work of the past thousand years went for nothing. This has obscured the fact, which is nevertheless obvious enough to a keener scrutiny, that the inner history of antiquity, ending as it did in despair of this world, must in any event have seen a recurrence of barbarism. The present world was a thing that men would neither enjoy, nor master, nor study. A new world was discovered, for the sake of which everything else was abandoned; to make sure of that world insight and intelligence were freely sacrificed; and in the light that streamed from

beyond, the absurdities of the present became wisdom, and its wisdom became foolishness.

Such is Neoplatonism. The pre-Socratic philosophy took its stand on natural science, to the exclusion of ethics and religion. The systems of Plato and Aristotle sought to adjust the rival claims of physics and ethics (although the supremacy of the latter was already acknowledged); but the popular religions were thrown overboard. The post-Aristotelian philosophy in all its branches makes withdrawal from the objective world its starting point. It might seem, indeed, that Stoicism indicates a falling off from Plato and Aristotle toward materialism, but the ethical dualism, which was the ruling tendency of the Stoa, could not long endure its materialistic physics, and took refuge in the metaphysical dualism of the Platonists. But this originated no permanent philosophical creation. From one-sided Platonism issued the various forms of skepticism, the attempt to undermine the trustworthiness of empirical knowledge. Neoplatonism, coming last, has borrowed something from all the schools. First, it stands in the line of post-Aristotelian systems; it is, in fact, as a subjective philosophy, their logical completion. Secondly, it is founded on skepticism; for it has neither interest in, nor reliance upon, empirical knowledge. Thirdly, it can justly claim the honor of Plato's name, since it expressly goes back to him for its metaphysics, directly combating with those of Stoa. Yet even on this point it has learned something from the Stoics; the Neoplatonic conception of the action of the Deity on the world and of the essence and origin of matter can only be explained by reference to the dynamic pantheism of the Stoa. Fourthly, the study of Aristotle also exercised an influence on Neoplatonism. This appears, not only in its philosophical method, but also—though less prominently—in its metaphysics. And, fifthly, Neoplatonism adopted the ethics of Stoicism; although it was found necessary to supplement them by a still higher conception of the functions of the spirit.

NEOPTOLEMUS was the son of Achilles and Deidamia, one of the daughters of Lycomedes of Scyros, at whose court Achilles was concealed by his mother in female attire to keep him away from the Trojan War. He was brought to Troy in the last year of the war by Ulysses, whom he helped in persuading Philoctetes to come from Lemnos to aid the Greeks, and he was one of the warriors in the wooden horse. It was he who killed Priam during the sack of the city.

NEPAL, NEPAUL, or NIPAL, is a small independent state, situated on the northeastern frontier of Hindustan. Its extreme length is about 525 miles, and in breadth it varies from 90 to 140 miles. Its population is estimated by the natives at about 5,000,000.

NEPHRITE. See JADE.

NEPOMUK, ST. JOHN OF. See JOHN.

NEPOS, CORNELIUS, a Roman historian, friend of Catullus, Cicero, and Pomponius Atticus, was probably a native of Verona. Nothing is known of his life, but he is recorded to have written a universal history under the title *Chronica* letters to Cicero, and other works, especially a series of biographies styled *De Viris Illustribus*.

NEPOS, JULIUS. The last but one of the emperors of the West, from 474 to 475, was a nephew of that Marcellinus who in the latter half of the fifth century had established a semi-independent principality in Dalmatia. After the death of Olybrius, on October 23, 472, the throne of the West remained for some months vacant, during which Italy was abandoned to lawless barbarians. On March 5, 473, the army, at the instigation of Gundobald the Burgundian, who had succeeded to the power and authority of his uncle

Ricimer, raised Glycerius, an obscure officer, to the imperial dignity. Meanwhile Leo I., emperor of the East, was discussing with his council the election of a new colleague for the Western empire. At length choice was made of Nepos, who married a niece of the empress Verina.

NEPTUNE, the Roman god of the sea, is probably adopted from Greek religion. The earliest reference to his worship is on the occasion when the Sibylline books included him among the gods to whom the first lectisternium was dedicated, 399 B.C. In the poets no trait of Neptune occurs that is not directly borrowed from the Greek Poseidon. His festival, Neptunalia, was celebrated on July 23, and his temple stood near the Circus Flaminius.

NÉRAC, a town of France, formerly the capital of the duchy of Albret, is situated in the department of Lot-et-Garonne, on both banks of the Bayse, a navigable tributary of the Garonne, sixteen miles west-south-west of Agen.

NERBÜDDA (properly NARBADĀ), one of the great rivers of India, traditionally regarded as the boundary between Hindustan proper and the Deccan. It rises on the summit of Amarkantak hill, in Rewah state, and, after a westward course of 800 miles through the Central Provinces and Guzerat, falls into the sea in the Bombay district of Broach. During its passage through the Central Provinces several falls interrupt its course, the principal of which are a series of glittering cascades and rapids for some hundreds of feet down the heights of Amarkantak, and the well-known falls of the "Marble rocks" nine miles below Jabalpur.

NEREUS, the old man of the sea, was described in Greek legend as full of wisdom and knowledge, friendly to men, but requiring compulsion before he reveals to them all that he knows. The struggle in which Heracles wrestles and overcomes him is a favorite subject of early Greek art; Heracles, the representative of toiling, active man, bends to do his will even the power of the sea. The fifty daughters of Nereus, the Nereids, are personifications of the smiling, quiet sea with all the gifts which it offers to men.

NERI, PHILIP. Filippo Neri, one of the most remarkable and individual figures among the ecclesiastics of the sixteenth century, was born at Florence, July 21, 1515. In 1548 he founded the celebrated confraternity of the Santissima Trinità de' Pellegrini e de' Convalescenti, whose primary object is to minister to the needs of the thousands of poor pilgrims accustomed to flock to Rome, especially in years of jubilee, and also to relieve the patients discharged from hospitals, but still too weak for labor. In 1551 he passed through all the minor orders, and was ordained deacon, and finally priest on May 23d. He settled down, with some companions, at the hospital of San Girolamo della Carità, and while there tentatively began, in 1556, the institute with which his name is more especially connected, that of the Oratory, after a plan he had formed of proceeding as a missionary to India was abandoned at the instance of shrewd advisers, who saw that there was abundant work to be done in Rome, and that he was the man to do it.

The Florentines, however, built in 1574 a large oratory or mission-room for the society contiguous to San Giovanni, in order to save them the fatigue of the daily journey to and from San Girolamo, and to provide a more convenient place of assembly, and the headquarters were transferred thither. It was immediately after taking possession of their new quarters that Filippo Neri formally organized, under permission of a bull dated July 15, 1575, a community of secular priests, entitled the Congregation of the Oratory. Neri con-

inued in the government of the Oratory until his death, which took place on May 26, 1595, in the eightieth year of his age. There are many anecdotes told of him which attest his possession of a playful humor, united with shrewd mother-wit, often urging him to acts with a ludicrous aspect, but which were well calculated to serve his purpose of divesting religion of the hyper-professional garb it wore in his day, and bringing it within the area of ordinary lay experience. This, rather than the atmosphere of supernaturalism with which he is surrounded in the various biographies of him which have appeared, and that to a much greater degree than is common in similar writings, is the true key to his popularity, and to the fact that his name figures often in the folk-lore of the Roman poor, whom he loved so well and served so long. He was beatified by Paul V. in 1600, and canonized by Gregory XV. in 1622.

NERO, Roman emperor, the only child of Cn. Domitius Ahenobarbus and the younger Agrippina, was born at Antium on December 15, 37 A.D., nine months after the death of the emperor Tiberius. His father Domitius, at best a violent, pleasure-seeking noble, died when Nero was scarcely three years old. In the previous year (39 A.D.) his mother had been banished by order of her brother the emperor Caligula on a charge of treasonable conspiracy, and Nero, thus early deprived of both parents, found a bare shelter in the house of his aunt Domitia, where two slaves, a barber and a dancer, commenced the training of the future emperor. With the death of Caligula in 41 A.D., his prospects improved, for Agrippina was recalled from exile by her uncle, the new emperor Claudius, and resumed the charge of her young son. Nero's history during the next thirteen years is summed up in the determined struggle carried on by his mother to win for him the throne which it had been predicted should be his. On December 15, 51, Nero completed his fourteenth year, and Agrippina (who had caused the execution of the empress Messolina, and had married her uncle the emperor), in view of Claudius' failing health, determined to delay no longer his adoption of the toga virilis. The occasion was celebrated in a manner which seemed to place Nero's prospects of succession beyond the reach of doubt. On October 13, 54, Claudius died, poisoned, as all our authorities declare, by the orders of his unscrupulous wife. For some hours the fact of his death was concealed, but at noon the gates of the palace were thrown open, and Nero was presented to the soldiers on guard as their new sovereign. From the steps of the palace he proceeded to the praetorian camp to receive the salutations of the troops, and thence to the senate-house, where he was fully and promptly invested with all the honors, titles, and powers of emperor.

During the first five years of his reign, the golden "quinquennium Neronis," little occurred to damp the hopes excited by his behavior on succeeding to the throne. His clemency of temper was unabated. His promises of constitutional moderation were amply fulfilled, and the senate found itself free to discuss and even to decide important administrative questions. Abuses were remedied, the provincials protected from oppression, and the burdens of taxation lightened. On the frontiers, thanks chiefly to Corbulo's energy and skill, no disaster occurred serious enough to shake the general confidence in the government, and even the murder of Britannicus seems to have been easily pardoned at the time as a necessary measure of self-defense. But Seneca's fears of what the consequences would be, should Nero's sleeping passions once be roused, were fully verified by the result, and he seems to have seen all along from what quarter danger was to

be apprehended. He now plunged into excesses of all kinds, the mention of some of which would be enough to bring a blush to the cheek of a savage; and among the crimes by his instigation committed, murder was a common incident, while the horrible atrocities of incest with and murder of his mother gave to his name a preëminence among the moral monstrosities which the world has produced. No relation was sacred enough to shield the victim who had crossed the course of his passion or thwarted one of his bestial desires.

This series of crimes, in spite of the unvarying applause which still greeted all Nero's acts, had excited gloomy forebodings of coming evil, and the general uneasiness was increased by the events which followed. In 63 the partial destruction of Pompeii by an earthquake, and the news of the evacuation of Armenia by the Roman legions, seemed to confirm the belief that the blessing of the gods was no longer with the emperor. A far deeper and more lasting impression was produced by the great fire in Rome, an event which more than almost any other has thrown a lurid light around Nero's reign. The fire broke out on the night of July 18, 64, among the wooden booths at the southeast end of the Circus Maximus. Thence in one direction it rapidly spread over the Palatine and Velia up to the low cliffs of the Esquiline, and in another it laid waste the Aventine, the Forum Boarium, and Velabrum till it reached the Tiber and the solid barrier of the Servian wall. After burning fiercely for six days, and when its fury seemed to have exhausted itself, it suddenly started afresh in the northern quarter of the city, and desolated the two regions of the Circus Flaminius and the Via Lata. By the time that it was finally quenched only four of the fourteen regiones remained untouched; three had been utterly destroyed, and seven reduced to ruins. The conflagration is said by all authorities later than Tacitus to have been deliberately caused by Nero himself. But Tacitus, though he mentions rumors to that effect, declares that its origin was uncertain. Nero, however, undeterred by forebodings and rumors, proceeded with the congenial work of repairing the damage inflicted by the flames. In addition to the rebuilding of the streets, he gratified his love of magnificence by the erection of a splendid palace for himself. To defray the enormous cost, Italy and the provinces, says Tacitus, were ransacked, and in Asia and Achaia especially the rapacity of the imperial commissioners recalled the days of Mummius and of Sulla. It was the first occasion on which the provincials had suffered from Nero's rule, and the discontent it caused helped to weaken his hold over them at the very moment when the growing discontent in Rome was gathering to a head; for early in 65 Nero was panic-stricken amid his pleasures by the discovery of a formidable conspiracy against his life and rule.

The plan was that Nero should be murdered when he appeared as usual at the games in the circus, but the design was frustrated by the treachery of a freedman, Milichus, who, tempted by the hope of a large reward, disclosed the whole plot to the emperor. In a frenzy of sudden terror Nero struck right and left among the ranks of the conspirators. Piso was put to death in his own house; and his fall was rapidly followed by the execution of Pænius Rufus, Lucan, and many of their less prominent accomplices. Even Seneca himself, though there seems to have been no evidence of his complicity, could not escape the frantic suspiciousness of the emperor. For the moment Nero felt safe; but, though largesses and thanksgivings celebrated the suppression of the conspiracy, and the dazzling round of games and shows was renewed with even increased splendor, the effects of the shock were visible in the long and dreary

list of victims who during the next few months were sacrificed to his restless fears and savage resentment. Early, however, in the summer of 66, the visit of the Parthian prince Tiridates to Italy seemed to shed a ray of light over the increasing darkness of Nero's last years. He had long panted for an opportunity of displaying his varied artistic gifts before a worthier and more sympathetic audience than could be found in Rome. With this view he had already, in 64, appeared on the stage before the half-Greek public of Naples. But his mind was now set on challenging the applause of the Greeks themselves in the ancient home of art. Toward the end of 66 he arrived in Greece, accompanied by a motley following of soldiers, courtiers, musicians, and dancers, determined to forget for a time Rome and the irksome affairs of Rome with its conspiracies and intrigues.

But while Nero was reveling in Greece the dissatisfaction with his rule, and the fear and abhorrence excited by his crimes, were rapidly taking the shape of a resolute determination to get rid of him. That movements in this direction were on foot in Rome may be safely inferred from the urgency with which the imperial freedman Helius insisted upon Nero's return to Italy; but far more serious than any amount of intrigue in Rome was the disaffection which now showed itself in the rich and warlike provinces of the west. Meanwhile in Spain Galba had been saluted emperor by his legions, had accepted the title, and was already on his march toward Italy. Had Nero acted with energy he might still have checked the revolt. But he did nothing. He had reluctantly left Greece early in 68, but returned to Italy only to renew his revels. When, on March 10th, the news reached him at Naples of the rising in Gaul, he allowed a week to elapse before he could tear himself away from his pleasures. When he did at last reënter Rome, he contented himself with the empty form of proscribing Vindex, and setting a price on his head. In April the announcement that Spain also had revolted, and that the legions in Germany had declared for a republic, terrified him into something like energy. But it was too late. The news from the provinces fanned into flame the smoldering disaffection in Rome. During the next few weeks the senate almost openly intrigued against him, and the populace, once so lavish of their applause, were silent or hostile. Every day brought fresh instances of desertion, and the fidelity of the prætorian sentinels was more than doubtful. When finally even the palace guards forsook their posts, Nero despairingly stole out of Rome to seek shelter in a freedman's villa some four miles off. In this hiding-place he heard of the senate's proclamation of Galba as emperor, and of the sentence of death passed on himself. On the approach of the horsemen sent to drag him to execution, he collected sufficient courage to save himself by suicide from this final ignominy, and the soldiers arrived only to find the emperor in the agonies of death. Nero died on June 9, 68, in the thirty-first year of his age and the fourteenth of his reign, and his remains were deposited by the faithful hands of Acte in the family tomb of the Domitii on the Pincian Hill. With his death ended the line of the Cæsars, and Roman imperialism entered upon a new phase.

NERTCHINSK, a district town of eastern Siberia, situated in the government of Transbaikalia, 178 miles to the east of Tchita, on the left bank of the Nertcha, three miles from its junction with the Shilka.

NERTCHINSK (in full **NERTCHINSKIY ZAVOD**), a town and silver-mine situated in the government of Transbaikalia, 185 miles east-southeast of the Nertchinsk noticed above (with which it is very often confounded),

on the Algacha river, a few miles above its junction with the Argun.

NERTCHINSK MINING DISTRICT, an area of more than 2,700 square miles, extending for nearly 270 miles from north to south, and comprising all the silver-mines and gold-fields situated between the Shilka and the Argun, together with a few on the left bank of the Shilka. It is traversed by several parallel chains of mountains which run from southwest to northeast, having their base on the eastern Transbaikalian plateau, while their summits rise to about 4,500 feet. These are intersected by a complicated system of deep, narrow valleys, densely wooded, with a few expansions along the larger rivers, where the inhabitants with difficulty raise some rye and wheat. Several of the villages that have sprung up around the silver-mines are more populous than the district towns of eastern Siberia.

NERVA, Roman emperor, was called to the throne on the murder of Domitian (September 18, 96). Nerva must have been born in 32 A.D., for he was sixty-four years old at the time of his accession in 96 A.D.

Nerva seems to have followed the custom established by his predecessors of announcing at the outset the general lines of his future policy. Domitian had been arbitrary and high-handed, and had heaped favors on the soldiery while humiliating the senate; Nerva naturally enough assumed the opposite attitude, and showed himself anxious in every way to respect the traditional privileges of the senate, and such maxims of constitutional government as still survived. Nerva seems, nevertheless, to have soon wearied of the uncongenial task of governing, and his anxiety to be rid of it was quickened by the discovery that not even his blameless life and mild rule protected him against intrigue and disaffection. Early, apparently, in 97 he detected a conspiracy against his life, headed by L. Calpurnius Crassus, but he contented himself with a hint to the conspirators that their designs were known, and with banishing Crassus to Tarentum. This ill-judged lenity provoked, a few months later, an intolerable insult to his dignity. The prætorian guards had keenly resented the murder of their patron Domitian, and now, at the instigation of one of their two prefects, Casperius Aelianus, whom Nerva had retained in office, they imperiously demanded the execution of Domitian's murderers, the chamberlain Parthenius, and Petronius Secundus, Aelianus' colleague. Nerva vainly strove to save, even at the risk of his own life, the men who had raised him to power, but the soldiers, disregarding his protests, brutally murdered the unfortunate men, and finally forced Nerva to propose a vote of thanks for the deed. This crowning humiliation convinced Nerva of the necessity of placing the reins of government in stronger hands than his own. Following the precedent set by Augustus, Galba, and Vespasian, he resolved to adopt as his colleague and destined successor a younger and more vigorous man, and his choice fell upon M. Ulpius Trajanus, already well known as a distinguished soldier, and at the time in command of the legions on the Rhine. In October, 97, in the temple of Jupiter on the Capitol, Trajan was formally adopted as his son, and declared his colleague in the government of the empire. For three months Nerva ruled jointly with Trajan; but, on January 27, 98, he died somewhat suddenly. He was buried in the sepulcher of Augustus, and divine honors were paid him by his successor.

NERVAL. See **GÉRARD DE NERVAL**.

NERVOUS SYSTEM. See **PHYSIOLOGY**.

NESELRODE, CHARLES ROBERT, long foreign minister of Russia, was born at Lisbon, where his father was Russian ambassador, in December, 1780. He died in 1862.

NESTOR, the old warrior of the *Iliad*, the wise counselor of the Greek leaders, was the son of Neleus and Chloris. He succeeded his father as king of Pylus. In the *Iliad* he is represented as too old to be of use in battle, but always ready to give advice and counsel to the younger warriors, and to entertain them with long accounts of his own exploits in his youth. According to Homer, he had ruled over three generations of men, and was as wise as the immortal gods. In the *Odyssey* he is described as still ruling over Pylus, where he is visited by Telemachus.

NESTOR, the patriarch of Russian literature, concerning whom we have but little information, except that he was a monk of the Pestcherski cloister of Kieff from 1073. The only other fact of his life told us is that he was commissioned with other monks to find the relics of St. Theodosius, a mission which he succeeded in fulfilling. His history begins with the deluge, as those of most chroniclers of the time did. He appears to have been acquainted with the Byzantine historians; he makes use especially of John Malala and George Armatolus. He also had in all probability other Slavonic chronicles to compile from, which are now lost.

NESTOR, the name applied to a small but remarkable group of Parrots peculiar to the New Zealand sub-region, now usually known as *Nestor meridionalis*, the "Kaka" of the Maoris and English settlers in New Zealand, in some parts of which it was, and even yet may be, very abundant, though its numbers are fast decreasing. The general color of the kaka is olive-brown, nearly all the feathers being tipped with a darker shade, so as to give a scaly appearance to the body. The crown is light gray, the ear-coverts and nape purplish-bronze, and the rump and abdomen of a more or less deep crimson-red; but much variation is presented in the extent and tinge of the last color, which often becomes orange and sometimes bright yellow. The kaka is about the size of a crow; but a larger species, generally resembling it, though having its plumage varied with blue and green, the *Nestor notabilis* of Gould, was discovered in 1856 by Mr. Walter Mantell, in the higher mountain ranges of the Middle Island.

NESTORIUS and NESTORIANIS. Nestorius, patriarch of Constantinople from 428 to 431, was a native of Germanicia, at the foot of Mount Taurus, in Syria. The year of his birth is unknown. On the death of Sisinnius, patriarch of Constantinople (December, 427), Theodosius II., indifferent to or possibly perplexed by the various claims of the local clergy, appointed Nestorius to the vacant see. The consecration took place on April 10, 428. While repressive measures were being carried on outside the pale of the Catholic church, equal care was taken to instruct the faithful in such points of orthodoxy as their spiritual head conceived to be the most important or the most in danger. One of these was that involved in the practice, now grown almost universal, of bestowing the epithet "Mother of God" upon Mary the mother of Jesus. In the school of Antioch the impropriety of the expression had long before been pointed out, by Theodore of Mopsuestia, among others, in terms precisely similar to those afterward attributed to Nestorius. From Antioch Nestorius had brought along with him to Constantinople a co-presbyter named Anastasius, who enjoyed his confidence and is called by Theophanus his "syncellus." This Anastasius, in a public oration which the patriarch himself is said to have prepared for him, caused great scandal to the partisans of the Marian cultus then beginning, by saying, "Let no one call Mary the mother of God, for Mary was a human being; and that God should be born of a human being

is impossible." The opposition, which was led by one Eusebius, a "scholasticus" or pleader who afterward became bishop of Dorylaeum, chose to construe this utterance as a denial of the divinity of Christ, and so violent did the dispute upon it become that Nestorius judged it necessary to silence the remonstrants by force; an over-zealous monk who had withstood him to his face was scourged and sent into exile, while many of the mob who sympathized were also punished with the lash.

Matters were soon ripe for foreign intervention, and the notorious CYRIL (*q.v.*) of Alexandria, in whom the antagonism between the Alexandrian and Antiochene schools of theology, as well as the perhaps inevitable jealousy between the patriarchate of St. Mark and that of Constantinople, found an exponent of unexampled determination and unscrupulosity, did not fail to make use of the opportunity. He stirred up his own clergy, he wrote to encourage the dissidents at Constantinople, and he addressed himself to the sister and wife of the emperor (Theodosius himself being known to be still favorable to Nestorius). Nestorius himself, on the other hand, having occasion to write to Pope Celestine I. about the Pelagians (whom he was not inclined to regard as heretical), gave from his own point of view an account of the disputes which had recently arisen within his patriarchate. This implied appeal, however, was the reverse of successful, for the pope, in a synod which met in 430, decided in favor of the epithet "Mother of God," and bade Nestorius retract his erroneous teaching, on pain of instant excommunication, at the same time intrusting the execution of this decision to the patriarch of Alexandria. On hearing from Rome, Cyril at once held a synod and drew up a doctrinal formula for Nestorius to sign, and also twelve anathemas covering the various points of the Nestorian dogmatic. Nestorius, instead of yielding to the combined pressure of his two great rivals, merely replied by a counter excommunication.

In this situation of affairs the demand for a general council became irresistible, and accordingly Theodosius and Valentinian III. issued letters summoning the metropolitans of the Catholic church to meet at Ephesus at Whitsuntide, 431, each bringing with him some able suffragans. Nestorius, with sixteen bishops and a large following of armed men, was among the first to arrive; soon afterward came Cyril with fifty bishops. Juvenal of Jerusalem and Flavian of Thessalonica were some days late. It was then announced that John of Antioch had been delayed on his journey and could not appear for some days; he, however, is stated to have written politely requesting that the opening of the synod should not be delayed on his account. Cyril and his friends accordingly assembled in the church of the Theotokos on June 22d, and summoned Nestorius before them to give an account of his doctrines. The reply they received was that he would appear as soon as all the bishops were assembled; and at the same time the imperial commissioner, Candidian, presented himself in person and formally protested against the opening of the synod. Notwithstanding these circumstances, Cyril and the 159 bishops who were with him proceeded to read the imperial letter of convocation and afterward the letters which had passed between Nestorius and his adversary. Almost immediately the entire assembly with one voice cried out anathema on the impious Nestorius and his impious doctrines, and after various extracts from the writings of church fathers had been read the decree of his exclusion from the episcopate and from all priestly communion was solemnly read and signed by all present, whose numbers had by this time swelled to 198. When the decision was known the populace,

who had been eagerly writing from early morning till night to hear the result, accompanied the members with torches and censers to their lodgings, and there was a general illumination of the city. A few days afterward (June 26th or 27th) John of Antioch arrived, and efforts were made by both parties to gain his ear; whether inclined or not to the cause of his former co-presbyter, he was naturally excited by the precipitancy with which Cyril had acted, and at a "conclabulum" of forty-three bishops held in his lodgings shortly after his arrival he was induced by Candidian, the friend of Nestorius, to depose the bishops of Alexandria and Ephesus on the spot. The efforts, however, to give effect to this act on the following Sunday were frustrated by the zeal of the Ephesian mob. Meanwhile a letter was received from the emperor declaring invalid the session at which Nestorius had been deposed unheard; numerous sessions and counter-sessions were afterward held, the conflicting parties at the same time exerting themselves to the utmost to secure an effective superiority at court. In the end Theodosius decided to confirm the depositions which had been pronounced on both sides, and Cyril and Meunon as well as Nestorius were by his orders laid under arrest. Representatives from each side were now summoned before him to Chalcedon, and at last, yielding to the sense of the evident majority, he gave a decision in favor of the "orthodox," and the council of Ephesus was dissolved. Maximian, one of the Constantinopolitan clergy, a native of Rome, was promoted to the vacant see, and Nestorius was henceforward represented in the city of his former patriarchate only by one small congregation, which also a short time afterward became extinct. The commotion which had been thus raised did not so easily subside in the more eastern section of the church; the Antiochenes continued to maintain for a considerable time an attitude of antagonism toward Cyril and his creed, and were not pacified until an understanding was reached in 433 on the basis of a new formula involving some material concessions by him. The union even then met with resistance from a number of bishops, who, rather than accede to it, submitted to deposition and expulsion from their sees; and it was not until these had all died out that, as the result of stringent imperial edicts, Nestorianism may be said to have become extinct throughout the Roman empire. Their school at Edessa was closed by Zeno in 489. As for Nestorius himself, immediately after his deposition he withdrew into private life in his old monastery of Euprepis, Antioch, until 435, when the emperor ordered his banishment to Petra in Arabia. A second decree, it would seem, sent him to Oasis, probably the city of the Great Oasis, in Upper Egypt, where he was still living in 439, at the time when Socrates wrote his *Church History*. The invasions of savage tribes compelled him to seek refuge in the Thebaid, where, however, the governor caused him to be dragged to Elephantis and subsequently to Panopolis. The time, place, and circumstances of his death are unknown; but zeal for theological truth and retributive justice has led at least one historian to exercise his invention in providing a fit end for the friendless heretic. The followers of Nestorius found toleration under the rulers of Persia, from which empire they gradually spread into India and even into Arabia and China. They also succeeded in securing a foothold among the Tartars. Their patriarch had his see for a considerable time at Seleucia-Ctesiphon, afterward in Bagdad, and then in Alkôsh. In the thirteenth century he is said to have had twenty-five metropolitans under him. The sect was almost exterminated by Timur.

MODERN NESTORIANS.—The remnants of the Aramaean Nestorians are to be found in diminishing num-

bers partly on Turkish, partly on Persian territory. Since the close of the seventeenth century the Roman Catholic mission, with its headquarters at Aleppo, has, through the powerful support of the French consuls, met with great success among the Nestorians, and has formed the converts into the so-called Chaldeans, or Nestorians connected with the Roman Catholic Church. Those Nestorians who still adhere to their ancient creed are settled on Turkish soil, mainly in the wild and inaccessible regions of eastern Kurdistan, and on Persian soil in the highly fertile plain to the west of the Lake of Urmia.

NESTS. See BIRDS.

NET. A net consists of a fabric of thread, twine, or cord, the intersections of which are firmly knotted so as to form meshes or interspaces of fixed dimensions, the meshes being usually lozenges of uniform size. The art of netting is intimately related to weaving, knitting, plaiting, and pillow-lace and machine-lace making, from all of which, however, it is distinguished by the knotting of the intersections of the cord. It is one of the most ancient and universal of arts, having been in all times commonly practiced among the rudest and most primitive tribes, to whom the net is of great importance in hunting and fishing.

Net-making, as a modern industry, is principally concerned with the manufacture of the numerous forms of net used in fisheries, but netting is also largely employed for many and varied purposes, as for catching game and birds, for the temporary division of fields, for protecting fruit in gardens, for collecting insects, for hammocks, and ship use, for screens and other furniture purposes, for ladies' hair, house bags, etc. While to a large extent net-making continues to be a handicraft, since the early part of the nineteenth century numerous forms of machine have been invented for netting, and several of these have been successfully introduced on a large scale in factories for the manufacture of fishing nets. Such fishing nets were formerly made principally from hemp fiber—technically called "twine;" but since the adaptation of machinery to net-making cotton has been increasingly used. Cotton nets, being more flexible and lighter than those made of twine, are much more easily handled and stowed and in practice they are rapidly superseding all others.

NETHERLANDS, KINGDOM OF THE. See HOLLAND. Pop. (1901), 5,179,100; area, 12,648 sq. m.

NETSCHER, GASPARD, portrait and genre painter, was born at Heidelberg in 1639. He died in 1684.

NETTLE is the vernacular equivalent of the Latin *Urtica*, which again gives its name to the *Urticaceæ*. The species of *Urtica* are herbs covered with stinging hairs, and with unisexual flowers on the same or on different plants. The male flowers consist of a perianth of four greenish segments inclosing as many stamens, which latter, when freed from the restraint exercised upon them by the perianth-segments while still in the bud, suddenly uncoil themselves, and in so doing liberate the pollen. The female perianth is similar, but incloses only a single seed-vessel with a solitary seed. The stinging hairs consist, at the base, of a bulbous reservoir filled with acrid fluid, and prolonged into a long, slender tube, the extremity of which is finely pointed. By means of this point the hair penetrates the skin and discharges its irritant contents beneath the surface.

NETTLERASH, or URTICARIA, a disorder of the skin characterized by an eruption resembling the effect produced by the sting of a nettle, namely, raised red or red and white patches occurring in parts or over the whole of the body, and attended with great itching and irritation. It may be acute or chronic. In the

former variety the attack appears connected with the digestive arrangements, and often comes on after indulgence in certain articles of diet, particularly various kinds of fruit, shell-fish, cheese, pastry, etc., also occasionally from the use of drugs, such as henbane, copaiba, cubebs, turpentine, etc. There is at first considerable feverishness and constitutional disturbance, together with faintness, which either precede or accompany the appearance of the rash. The eruption may appear on any part of the body, but is most common on the face and trunk. In the former position it causes swelling and disfigurement while it lasts, and is apt to excite alarm in persons unacquainted with its nature. The attack may pass off in a few hours, or may last for several days, the eruption continuing to come out in successive patches. The chronic variety consists in an eruption similar to that above described, but lasting with interruptions for a length of time often extending to months or years. This form of the disease occurs independently of errors in diet, and is not attended with the feverish symptoms characterizing the acute attack. It is probably connected with constitutional conditions, and is occasionally observed in the gouty. As regards treatment, the acute variety generally yields quickly to a purgative and the use of some antacid, such as magnesia or liquor potassæ. The local irritation is allayed by sponging with a warm alkaline solution (soda, potash, ammonia), or a solution of acetate of lead. In the chronic form, in addition to these remedies, any constitutional morbid condition will demand special attention.

NETTLE-TREE is the name applied to certain trees of the genus *Celtis*, and belonging to the family *Urticaceæ*. The best-known species have usually obliquely ovate or lanceolate leaves, serrate at the edge, and marked by three prominent nerves. The flowers are inconspicuous, usually hermaphrodite, with a four or five parted perianth, as many stamens, a hairy disk, and a one-celled ovary with a two-parted style. The fruit is succulent like a little drupe, a character which serves to separate the genus alike from the nettles and the elms, to both of which it is closely allied. The wood of *Celtis australis* of southern Europe is made use of for a variety of purposes, while the leaves serve as forage. An oil for burning is extracted from the seed of *Celtis occidentalis*. A North-American species is used for like purposes.

NEU-BRANDENBURG, a flourishing town in Mecklenburg-Strelenitz, Germany, situated on a small lake called the Tollenser-See, about sixty miles to the west of Stettin.

NEUBURG, a small town of Bavaria, in the district of Schwaben and Neuburg, is pleasantly situated on the Danube, and in 1900 contained 7,890 inhabitants, three-fourths of whom are Roman Catholics.

NEUCHÂTEL, or **NEUFCHÂTEL** (Germ., *Neuenburg*), a canton of Switzerland, consisting of a section of the Jura system (see **JURA**), between the Doubs valley and the Lake of Neuchâtel, is bounded on the northeast and east by Bern, on the southeast by its lake, which separates it from Freiburg and Vaud, on the south by Vaud, and on the west and northwest by France (department of Doubs). The greatest length is about thirty miles, the average breadth eleven, and the area 312 square miles. Pop. (1901), 126,279.

NEUCHÂTEL, the capital of the above canton, stands near the north end of the lake, at the mouth of the Seyon, partly on low alluvial ground and partly on the slope of the Jura. It has railway communication by Yverdon with Lausanne and Pontarlier, by Bienné with Basel, by Chaux-de-Fonds with Locle and also with Basel, and by the Val de Travers with Pontarlier. The population in 1901 was 20,916.

NEUCHÂTEL, THE LAKE OF, along with the connected lakes of Morat and Bienné, is the modern representative of the large body of water which at one time occupied the whole lower valley of the Aar. It is twenty-five miles in length, at its broadest part it measures six miles, its maximum depth is five hundred feet, and the area is ninety-two square miles.

NEUHÄUSEL, a town of Hungary, in the district of Neutra, is situated on the river Neutra and on the railway from Pressburg to Pesth, about sixty miles from each of these towns. It was formerly a strong fortress, and played an important part in the wars with the Turks, and in the risings with Bethlen Gabor and Prince Rakoczky, but the works were razed in 1724.

NEUHOF, THEODOR, BARON VON, who for a short time was nominally king of Corsica as Theodore I., was the son of a Westphalian noble, and was born at Metz about 1690. After various adventures he came in 1732 to Florence as representative of the emperor Charles VI. Having here made the acquaintance of several Corsican patriots, he succeeded by expressing strong sympathy with their cause, and promising to gain assistance for them in their resistance to the Genoese, in being accepted as a candidate for the Corsican throne. After fruitless endeavors to interest various European sovereigns in their behalf, he made his way to the dey of Tunis. From him he obtained a shipload of supplies and ammunition, with which he landed at Corsica on March 14, 1736. He was received with the utmost enthusiasm, and in the following April was crowned king as Theodore I. By the help of a body-guard of 400 men, and the lavish distribution of new titles, he succeeded for some time in retaining his position, but failing in an effort to capture Bastia from the Genoese, he at the end of eight months resigned his power into the hands of a council of regency, and left the island. After the departure of the French in 1743 he endeavored to reestablish his authority, but found the faction against him so strong that he was soon compelled again to leave Corsica. He died December 11th of the same year.

NEUILLY-SUR-SEINE, a town of France, at the head of a canton in the arrondissement of St. Denis (department of Seine), lies between the line of the Paris fortifications, the Bois de Boulogne, the right bank of the Seine, and the village of Levallois-Perret, which was formerly included within its limits. The population is (1901) was 36,437.

NEUMANN, CARL FRIEDRICH, the well-known Orientalist, was born of Jewish parents at Reichmansdorf, near Bamberg, Bavaria, on December 22, 1798. He died in 1870.

NEU-MÜNSTER, a town of Prussia, in the province of Schleswig-Holstein, district of Kiel, lies on both banks of the small river Schale, in the basin of the Stör. In 1900 it contained 11,623 inhabitants, almost exclusively Protestant.

NEUNKIRCHEN, or **OBER-NEUNKIRCHEN**, a small manufacturing town of Prussia, in the district of Treves and circle of Ottweiler, is situated on the Blies, twelve miles to the northwest of Saarbrücken. The 15,647 inhabitants (1899) consist of Protestants and Roman Catholics in almost equal proportions.

NEURALGIA, literally *nerve pain*, is a term which is frequently employed both technically and popularly in a somewhat loose manner, to describe pains the origin of which is not clearly traceable. In its strict sense it denotes the existence of pain in some portion or throughout the whole of the distribution of a nerve without any distinctly recognizable structural change in the nerve or nerve centers. This strict definition, if adhered to, however, would not be applicable to a large number of cases of neuralgia; for it is well known that in not a few

instances the pain is connected with some source of irritation, by pressure or otherwise, in the course of the affected nerve; and hence the word is generally used to indicate pain affecting a particular nerve or its branches from any cause. There are few ailments which give rise to greater human suffering than neuralgia, and some of the chief causes concerned in its production, or the conditions most frequently found associated with it, may be briefly alluded to.

The pain of neuralgia is generally localized, but may come to extend beyond the immediate area of its first occurrence. It is usually of paroxysmal character, and not unfrequently periodic, occurring at a certain time of the day or night. It varies in intensity, being often of the most agonizing character, or less severe and more of a tingling kind. Various forms of perverted nerve function may be found coexisting with or following neuralgia. Thus there may be hyperesthesia, anesthesia, paralysis, or alterations of nutrition, such as wasting of muscles, whitening of the hair, etc. Attacks of neuralgia are liable to recur, particularly when the general health is low, and some persons unhappily continue to suffer from occasional attacks during the greater part of their lifetime.

In the treatment of all forms of neuralgia it is of first importance to ascertain, if possible, whether any constitutional morbid condition is associated with the malady, for otherwise the most powerful and approved remedies will often fail. Thus, if evidence of rheumatism, gout, anæmia, etc., be present, treatment appropriate to these conditions must be employed.

When the attack is periodic the administration of a large dose of quinine two or three hours previous to the usual time of the seizure will often mitigate, and may even prevent, the paroxysm. In migraine, caffeine and its preparations are recommended. Many topical applications are of great efficacy. The various liniments or ointments containing the preparations of opium, belladonna, or aconite rubbed into the affected part will often soothe the most severe local pain. An excellent sedative application is a lotion composed of equal parts of camphor and chloral painted or gently rubbed over the painful area. In many cases relief may be obtained by the hypodermic injection of morphia or atropia, by acupuncture, by blisters, or by counter-irritation with the button cauterizer.

NEUROPTERA. See **INSECTS**.

NEU-RUPPIN, the chief town of a circle in the district of Potsdam and province of Brandenburg, Prussia, lies on the west bank of a small lake (the Ruppiner See), thirty-seven miles to the northwest of Berlin. Its inhabitants are employed in the manufacture of cloth, starch, and machinery, iron-founding, and lithography. In 1901 they numbered 15,985.

NEU-SANDEC, or **NEU-SANDEZ**, the chief town of a district in western Galicia, lies on the river Dunajec, about forty-five miles to the southeast of Cracow. It contains 11,185 inhabitants, most of whom are Protestants.

NEUSATZ, a royal free town of Hungary, in the province of Bács, and the seat of a Greek non-united bishop, lies on the left bank of the Danube, opposite Peterwardein, with which it is connected by a bridge of boats. It is about 150 miles to the south of Pesth and 50 miles above Belgrade. Nearly one-half of its 21,325 inhabitants are Serbs, the other half being made up of Magyars, Germans, and Jews; and it has recently become a sort of religious and literary center for the Serbs of Hungary.

NEUSOHL, an ancient mining town of Hungary, the capital and see of the district of Sohl, is prettily situated at the confluence of the Gran and the Bistritz, in

a fertile valley inclosed by lofty hills, eighty-five miles to the north of Pesth.

NEUSS, a busy manufacturing town of Rhenish Prussia, lies four miles to the west of Düsseldorf and one and a half miles from the west bank of the Rhine, with which it is connected by the Erft canal, uniting the Rhine and the Meuse. In 1900 it contained 18,495 inhabitants, of whom 16,077 were Roman Catholics.

NEUSTADT, a manufacturing town of Prussia, Silesia, in the district of Oppeln, is situated on the river Prudnik or Prudnitz, sixty miles to the southeast of Breslau. In 1900 the population was 15,292, including 12,300 Roman Catholics.

NEUSTADT, or **WIENER-NEUSTADT**, an important manufacturing town in Lower Austria, is situated between the Fischa and the Leitha, close to the Hungarian frontier, and twenty-five miles to the south of Vienna. The population in 1900 was 25,468, nearly all Roman Catholics.

NEUSTADT-AN-DER-HAARDT, a small manufacturing town in the Bavarian Palatinate, is picturesquely situated at the base of the Haardt mountains and the mouth of the valley of the Speyerbach, fourteen miles to the east of Spires and the Rhine.

NEUSTADT-EBERSWALDE, at present officially named **EBERSWALDE** simply, is a manufacturing town of Prussia, province of Brandenburg, situated twenty-eight miles to the northwest of Berlin, on a canal connecting the Oder and the Havel. In 1900 the population was 12,524, including 436 Roman Catholics and 171 Jews.

NEU-STETTIN, a manufacturing town in Prussia, in the province of Pomerania and district of Köslin, lies on the small Streitzig lake, ninety miles to the northeast of Stettin.

NEU-STRELITZ, the capital of the grand-duchy of Mecklenburg-Strelitz, is charmingly situated between two small lakes, sixty miles to the north of Berlin. It is well and regularly built in the form of a star, the eight rays of which converge on a spacious market-place, adorned with a statue of duke George (d. 1860). The ducal residence is a handsome edifice in a pseudo-classical style, with a library of 70,000 volumes, and collections of coins and antiquities. Pop. (1900), 11,344.

NEUSTRIA. See **FRANCE**.

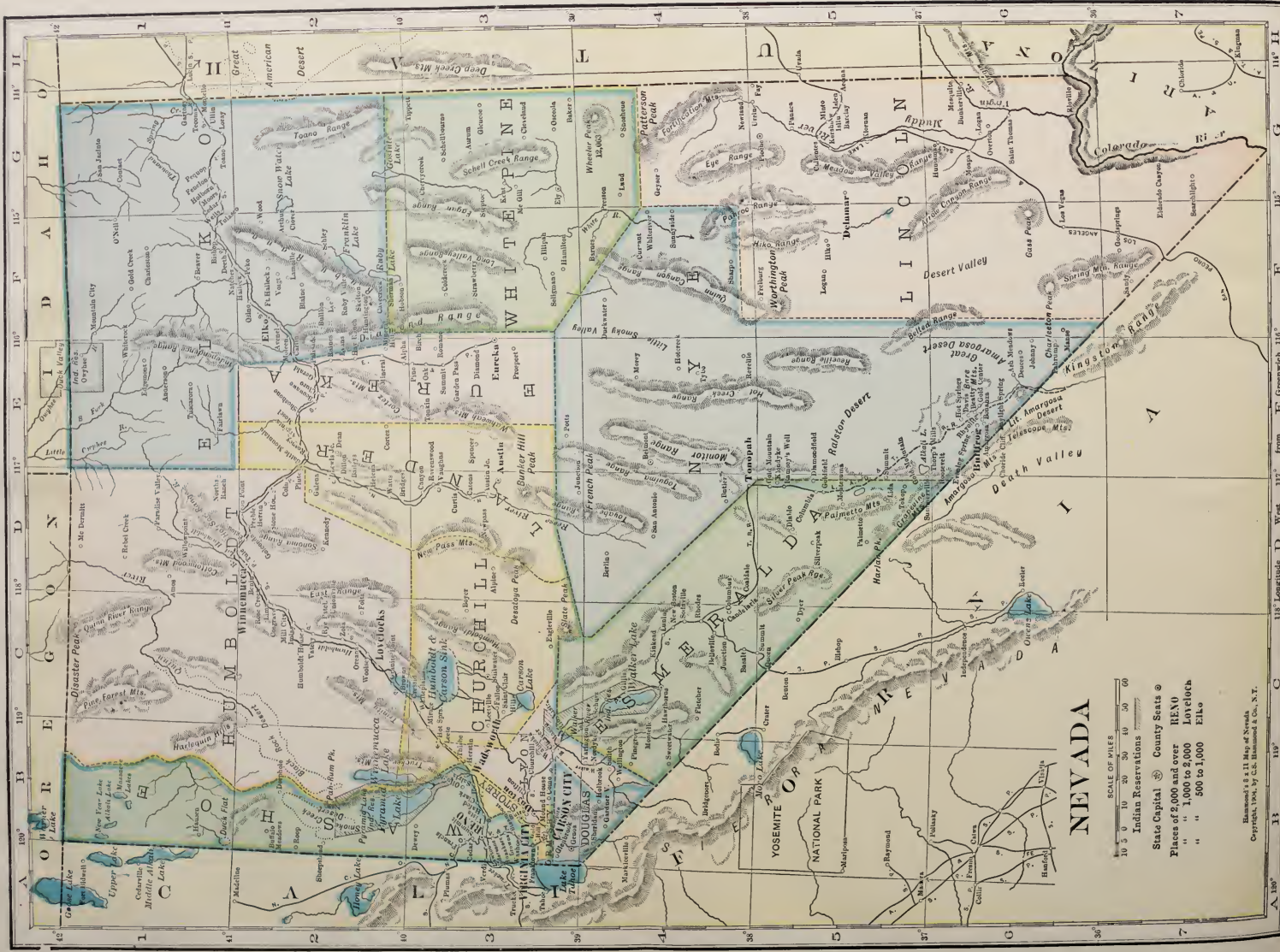
NEU-TITSCHKEIN, a small but thriving town of Moravia, is picturesquely situated on an outlying spur of the Carpathians, on the Titsch, an affluent of the Oder, about seventy miles to the northeast of Brünn. It contains (1899) 12,274 inhabitants, almost entirely of German descent.

NEUTRA, the chief town of a district and bishopric of the same name in Hungary, is situated on the river Neutra, ninety miles to the east of Vienna.

NEUTRALITY. See **INTERNATIONAL LAW**.

NEUWIED, the chief town of a circle in the district of Coblenz, Rhenish Prussia, and the capital of the mediatized countship of Wied, is pleasantly situated on the right bank of the Rhine, eight miles below Coblenz.

NEVA, a river of Russia which carries off into the Gulf of Finland the waters of Lakes Ladoga, Onega, and Ilmen and many smaller basins. It issues from the southwest corner of Lake Ladoga, in two channels which form the island of Oriekhoff, and are obstructed by sandstone reefs, so that the better of the two has a depth of only from seven to sixteen feet in its fairway. A little farther down it becomes completely navigable, and in the neighborhood of the island of St. Nicholas it attains a breadth of 4,200 feet; but between the village of Ostrovkoff and that of Ust-Tosnui (Tosna-mouth) it passes over a limestone bed which, lying only from two to twelve feet below the surface, produces a series



of rapids, and reduces the width of the river to from 1,050 to 840 and that of the navigable passage to from 350 to 175 feet. From Ust-Tosnui downward there is no further obstacle.

NEVADA, one of the most western of the States of the American Union, was formed from a portion of the territory acquired by the United States from Mexico by the treaty of Guadalupe Hidalgo. The area is 110,700 square miles. The State is bounded on the south and west by California, north by Oregon and Idaho, and east by Utah and Arizona. At the time of the discovery of the silver mines (1858-59) what is now the State of Nevada was a part of Utah. By act of Congress of March 2, 1861, Nevada became a Territory; and, with a modification of its boundaries, it was admitted as a State on October 31, 1864.

By the upheaval in past ages of the Rocky Mountains and the Sierra Nevada, there was inclosed an ancient sea, several hundred thousand square miles in extent. The draining off and evaporation of the waters so inclosed left an immense plateau, having a general elevation of 4,000 to 6,000 feet above the present sea-level. Although this table-land is spoken of as a "basin," yet throughout its whole extent it is traversed by ranges of mountains rising from 1,000 to 8,000 feet above the general surface, and having the same northward and southward trend as the Sierra Nevada and the Rocky Mountains. The surface of the country as a whole presents a very barren, rocky, and mountainous appearance, yet between the parallel ranges are valleys from five to twenty miles in width, all having about the same altitude above the sea. Where traversed by rivers or creeks these contain considerable areas of arable land, the amounts usually being proportionate to the size of the streams. They are timberless, except for a few cottonwood trees found along the rivers. Upon the mountains the quantity of timber depends upon the altitude. The lower ranges are bare, or contain only a scanty growth of piñon, cedar, or mountain mahogany, of very little economic importance. Several of the higher ranges contain small bodies of valuable timber, while the eastern slope of the Sierra Nevada is well clothed with forests of conifers, which have proved of inestimable value to the people of the State.

The river system is peculiar, only two of the streams of the State finding their way to the sea: the Owyhee, which rises in the northern part, empties into the Snake, and thence passes through the Columbia river to the Pacific Ocean; and the Colorado river, on the southern boundary, flows into the Gulf of California. All the other streams either sink in the sand of the interior valleys or terminate in lakes that have no outlet. The Humboldt river, about 300 miles long, empties into Humboldt Lake or "Sink;" Truckee river, which drains Lakes Tahoe and Donner (in the Sierra Nevada), after a course of 125 miles, falls into Pyramid and Winnemucca Lakes. Walker river, 100 miles long, rises in the Sierra and discharges into Walker Lake; Carson river, 180 miles long, also rises in the Sierra Nevada, and empties into the "Sink of the Carson" or Carson Lake. Reese river rises in the Toyabe Range (within the basin region), and after a course of about 150 miles disappears in the sand; Quinn river, in the northern part of the State, after a course of 80 miles, similarly disappears in the soil; the Amargosa (bitter) river, in the southern part of the State, is 150 miles long, and, after sinking and rising several times, finally loses itself in the sands of Death Valley just over the line in California. Such of the creeks as are not tributaries of the rivers either sink in the sandy plains or end in small pools. Most of the lakes are merely sinks for the scanty streams. In many places on the sides of the mountain ranges are

to be seen well-defined water-lines of the ancient sea or of extinct lakes, indicating a far greater extension of water surface and a much moister climate than at present. Hot springs, many of which have medicinal virtues, are found in all parts of Nevada. The most noted are the Steamboat Springs, in Washoe Valley, on the line of the Virginia and Truckee Railroad.

The climate of Nevada is characterized primarily by its extreme aridity. The air currents from the Pacific are thoroughly drained of their moisture before reaching the borders of the Great Basin, and pass over it as dry winds. In the southern part of the State, where the elevation above sea is least and the temperature highest, the rainfall averages not more than five inches per annum, while the evaporation is extremely rapid. In the northern part the rainfall is greater, averaging not far from fifteen inches in many localities. Nowhere, however, is it sufficient for the needs of agriculture, and consequently irrigation has to be universally resorted to. The mean annual temperature in the habitable portions of the State ranges from 70° Fahr. in the south to 45° in the north. This, however, expresses but a part of the conditions of temperature. The range between summer and winter, and between day and night, is very great.

The fauna of the State is poor, and illustrates, with the flora, the aridity of the climate. Coyotes, badgers, and rabbits are perhaps the most abundant animals, as they certainly are the most characteristic. In the more northern valleys are to be found, in the winter, herds of antelope, and occasionally a few deer and elk. In the Sierra, except where driven away by the encroachments of civilization, large game, consisting of elk, deer, and black and grizzly bears, are still to be found in greater or less abundance. The flora is also scanty, and is characterized by *Artemisia*, so that Nevada is often nicknamed the "Sage-brush" State. In the southern valleys even this fails, and the sterility is relieved by little save *Yucca* and various species of *Cactus*. In the northern valleys, and particularly upon the lower mountains and hills, the bunch grasses replace *Artemisia* to a considerable extent, although not sufficiently to give the interest of meat production great prominence in the State.

The State is rich in mineral productions of all kinds. Silver is, however, the leading mineral product, and the mines of the Comstock at Virginia City and Gold Hill have been among the richest in the world. Since the discovery in 1859 these mines have yielded a large amount of silver and gold, and the product of the whole State hitherto has been about \$123,000,000. Two mines on the Comstock, the California and the Consolidated Virginia (known as bonanza mines), have yielded the greater portion of the silver and gold, the bullion of the Comstock being about one-third gold and two-thirds silver. The rich deposits of the vein, known as "bonanzas," have, however, now been exhausted as far as discovered, and since 1880 the yield from the Comstock lode has been light. Explorations, however, are actively continued. In the Yellow Jack and Belcher mines the workings have reached a depth of 3,000 feet, and in the Ophir and Mexican mines they are drifting at a point 3,100 feet below the surface, the greatest depth to which mining operations have been carried anywhere on the American continent. At these great depths the lode is found to diminish neither in width nor strength of formation. The heat of the rock is intense in these levels, and it is possible for men to work only for very short periods, requiring frequent shifts. The Sutro tunnel, over 20,000 feet in length, drains all the leading mines of the lode to a depth of 1,600 feet, thus saving much pumping. There are millions of tons of low-grade ore in the many mines of the Comstock which will be mined at no distant day, but which cannot

be profitably worked at the present high rates of wages and great cost of transportation and reduction. In the eastern part of the State, at Eureka and several other points, are mines which produce smelting ores containing too much lead to be worked by mill process, as are the free chloride and sulphuret ores of the Comstock. Many of these "base metal veins," as they are called by the miners, are very rich in silver, have been profitably worked for several years, and are still yielding well. All the interior ranges of mountains in the State contain veins producing gold, silver, copper, lead, and antimony in paying quantities, but as yet little mining has been done except for gold and silver. The many rich mines of copper have scarcely been touched. Besides the metals mentioned, there are found within the borders of Nevada iron, platinum, zinc, nickel, cobalt, quicksilver, lignite, gypsum, kaolin, beds of pure sulphur, and in the plains and marshes deposits of pure salt, carbonate of soda, borax, nitrate of potash, and other minerals of a similar nature.

The following table gives the crops for the year 1899:

CROPS	QUANTITY.	ACRES.	VALUE.
Indian Corn, Bushels	14,614	580	\$ 11,736
Wheat..... "	450,812	18,537	263,351
Oats..... "	151,176	4,786	67,260
Barley..... "	224,035	7,043	126,748
Potatoes..... "	361,188	2,235	194,619
Hay and forage, tons	419,812	292,134	2,066,496
Total.....		325,315	\$2,730,110

While Nevada is not a country to attract the farmer, there is still a considerable amount of arable land within its borders. At present there are under cultivation only about 235,000 acres. Wherever, water for irrigation can be procured, good crops of most kinds of grain, hay, and vegetables may be grown. It has been estimated that by a full utilization of the streams for irrigation possibly 3 per cent. of the area of the State can be brought into cultivation; of this (some 2,000,000 acres) only about one-sixth has as yet been reduced to the service of man. It is not probable, however, that Nevada will ever attain to a high rank as an agricultural State.

The manufacturing interests of Nevada are not extensive and are confined mainly to the smelting and reduction of ores.

There are several railroads. The Central Pacific crosses the whole State, and has within its limits a length of 452 miles; the Virginia and Truckee runs from Reno, on the Central Pacific, through Carson to Virginia city, and is 52 miles long; the Carson and Colorado leaves the Virginia and Truckee near Virginia City, and running southward through the State taps a rich and extensive mineral and agricultural region. This road is now completed to Benton, Cal., 193 miles, and will eventually connect with the Southern Pacific at Mojave, Cal. The Nevada Central, 93 miles in length, connects the towns of Austin and Battle Mountain; and the Eureka and Palisade, 20 miles long, connects the places named. There are several shorter lines completed, and a considerable number projected.

There are in the State 236 common schools, 7 high schools, and a State University at the town of Elko. In all the large towns are churches of the leading religious denominations, and many of the church edifices are fine and costly structures. Thirty-seven newspapers are published, the majority being dailies.

The returns of the twelfth census place the assessed valuation of the real estate of Nevada at \$16,578,030, and the personal property at \$7,602,426, a total of

\$24,180,856. The true valuation was not over \$25,000,000 in 1900.

The figures for 1900-01 are as follows: Total debt, \$642,600; annual charge, \$24,360. Gross receipts in 1900, \$510,609; disbursements, \$533,403. Valuation December 1, 1899, \$26,738,378.53. Tax levy, 9 mills. Total State tax, \$714,827.55. Population 42,335. Valuation per capita, \$408.22. Tax per capita, \$10.91.

The State government is similar to that of the majority of the western states. Nevada has two representatives in the United States Senate and one in the House of Representatives.

The first settlement in Nevada was made at Genoa, at the foot of the Sierra Nevada, in 1850, though as early as 1848 the Mormons traveling between Salt Lake and California had established a temporary camp at that place. The Mormons made two or three small settlements in the valleys along the base of the Sierra, and until 1859, when the silver mines of the comstock were discovered, they were the principal white inhabitants. The discovery of silver caused great crowds of miners of all nationalities to pour over the Sierra Nevada from California, and in that year and 1860 several towns were laid out and rapidly built up. In a few years new mineral belts were discovered to the eastward, and soon there were founded many interior towns and camps.

In 1870 the population was 42,491. In 1880 it had increased to 62,266 (1 to 1½ square miles), a gain of 46.5 per cent. In 1890 it showed a falling off from the the number in 1880. The population shows a great disproportion of males, as is everywhere the case on the frontier, especially in a mining region. The census returns of 1900 showed a total of 42,335. There was also a disproportionately large number of the foreign born, 32,242 being natives and 10,093 foreigners. With the Pacific coast states, Nevada has received a comparatively large accession of Chinese, these numbering 5,416, or more than one-eighth of the whole population of the State. The main body of the population is congregated in the extreme western portion of the State, in Storey and the adjacent counties. A second but much smaller body of population is about Eureka. The balance is dispersed very sparsely. There are comparatively few Indians in the State, and these, known as Pah Utes or Diggers and Shoshones, are theoretically upon reservations in the western part. Their number is estimated by the Indian office at 5,200. They are, as a class, both mentally and physically below the average of the North American tribes.

NEVADA. Nevada is a post-village of Missouri, in Vernon county, of which it is the capital. It lies on the Missouri, Kansas and Texas Railway, ninety miles southwest of Sedalia. It has a courthouse, two newspaper offices, three churches, a bank, two flour-mills and a foundry. Population (1900), 7,461.

NEVERS, a city of France, chief town of the department of Nièvre, and formerly capital of the county of Nevers or Nivernais, is picturesquely situated on a hill commanding the right bank of the Loire at the confluence of the Nièvre, 158 miles south-southeast of Paris by the railway to Nîmes. It is the see of a bishop, and has a fine cathedral, dating from the twelfth and fourteenth centuries.

NEVIANSK, a town of Russia, in the government of Perm, sixty-two miles to the north-northwest of Ekaterinburg, is situated on the eastern slope of the Ural mountains, in the populous valley of the Neiva, surrounded by mountains composed of talc and chlorite schists and granites, in a district very rich in iron and also in auriferous sands. The population in 1898 numbered 15,980 (17,950 with its suburb, the Byngovskiy iron-work).

NEVIS, an island in the Federated Leeward group, British West Indies, separated from St. Christopher by a shallow strait two miles broad at the narrowest. It is a mountain rising gradually to a height of 3,200 feet, the lower portion being cultivable; the total area is about 32,000 acres. The climate is healthy, the average height of the thermometer being 82° Fahr. Discovered by Columbus in 1498, and colonized by the English in 1628, it now forms one presidency with St. Christopher. The pop. (1901) was 12,774; the capital is Charlestown, on the shore of a wide bay on the southwest side of the island.

NEW ALBANY, a flourishing manufacturing city of the United States, in Floyd county, Ind., occupies a good position on the right bank of the Ohio, nearly opposite the west end of Louisville, 156 miles below Cincinnati. It is handsomely built, with wide and well-shaded streets, and among its public edifices are a city hall, a courthouse, an opera-house capable of containing 2,500 persons, a masonic hall, and an oddfellows' hall. Abundant water-power is obtained from the falls about two miles up the river. Besides the glass-works, which rank as the largest in the United States, the industrial establishments comprise foundries, pork-packing-houses, boatbuilding yards, rolling-mills, cotton and woolen mills, and hosiery-mills. Laid out in 1813, and incorporated as a city in 1839, New Albany increased its population from 4,226 in 1840 to 20,628 in 1900, and is still rapidly growing.

NEWARK (or in full **NEWARK-UPON-TRENT**), a municipal and parliamentary borough and market-town of Nottinghamshire, England, is situated in the midst of a flat but highly cultivated country, near the Trent, on the river Devon, and the Great Northern and Nottingham and Lincoln Railways, 120 miles north of London, and nineteen east of Nottingham. The population of the municipal and parliamentary borough (area 1,933 acres) in 1871 was 12,195, which in 1901 had increased to about 25,000.

NEWARK, the principal city of the State of New Jersey, United States, is situated in Essex county, on the west bank of the Passaic river, four miles above Newark Bay, and covers an area of about eighteen square miles. The original site was a crescent-shaped ridge, or double chain of low hills, extending from northeast to southwest, now much changed by leveling and cutting. The main part of the city is on the lower ground which stretches east and south toward the Newark and Hackensack Meadows (salt marshes). The surface is, in general, well adapted for drainage and sewage. The climate is mild, tempered by the proximity of Newark Bay and the Atlantic (twelve miles distant), and the place bears a good reputation for healthfulness. The water-supply comes from the Passaic. There are about 130 miles of streets, generally wide and well shaded, most of which are paved. The principal thoroughfare, Broad street (120 feet wide), is lined throughout a good part of its length with fine old elms, and where not occupied by business premises is fronted by numerous handsome residences. There are several small parks, the principal of which are Military and Washington Parks, bordering on Broad street.

Notwithstanding that the central portion of Newark is but nine miles distant from the general postoffice in New York city—being considerably nearer that point than are the northern portions of New York city proper—Newark has more the character of an independent city than a suburb. This it owes in part to its situation within another State, but still more to its independent and distinctive manufacturing interests. Even prior to 1872 it was called "the Birmingham of America." In that year a very successful exhibition, consisting of the

manufactures of Newark, greatly stimulated the investment of capital.

The United States census of 1900 gives the following statistics of manufactures for Newark:

No. of Industries.	Capital Invested.	Wages Paid Annually.	Total Value of Products.	Persons Employed		
				Males	Fem.	Child'n
3,339	\$103,191,403	\$29,534,311	126,954,049	42,151	9,246	5,649

Since 1880 the increase has been marked, these figures falling far below present estimates.

The principal industries are jewelry, tanning and currying, celluloid (a substitute for ivory, coral, etc.) and celluloid goods, hatmaking, boot and shoe making, trunk and valise making, saddlery hardware, harness-making, breweries (mostly lager beer) and malthouses, building, carriage and wagon making, clothing, chemical works, cigar and tobacco factories, edge tools, hammers, etc., cabinetmaking, and iron and steel works. There are also large cotton, woolen, and silk-thread factories, and an extensive sewing-machine factory, together employing about 9,000 hands.

The shipping facilities of Newark are abundant, and four great trunk lines of railroad—the Pennsylvania, the New York, Lake Erie and Western, the Delaware Lackawanna and Western, and the Central Railroad of New Jersey (Reading Railroad)—give ready communication to all parts of the United States, and with the steamship lines at Jersey City and New York. Newark is intersected by the Morris Canal, and has considerable coasting trade by way of the Passaic river. The city has numerous churches and missions, comprising Presbyterian, Reformed Presbyterian, United Presbyterian, Congregational, Reformed Dutch, Baptist, Episcopal, Reformed Episcopal, Methodist, Lutheran, Roman Catholic, Jewish synagogues, besides Bethel, Universalist, Unitarian, Independent Catholic, and other independent churches. It has an admirable free public school system. The bonded debt in 1902 was \$17,585,000; sinking fund, \$4,928,560. The city's expenditures (1901) were \$4,730,462 out of the total receipts amounting to \$5,698,654. The assessed valuation for tax purposes amounts to \$157,320,684.

In 1810 the population of Newark was 6,000; in 1836, when the town became a city, it was 19,732; in 1840 it was 17,290, shortly after which began a stream of immigration which has continued almost uninterruptedly since. In 1850 the population had more than doubled, reaching 38,804; in 1860 it was 71,941, having again almost doubled; during the next decade, including the period of the civil war, it increased to 105,059, and it has since grown in like ratio, being 136,508 in 1880. This had risen to 246,070 in 1900.

History.—On or about May 17, 1666—the exact date cannot be determined—there anchored in the Passaic river, opposite what is now Newark, a small vessel from Milford, Conn., having on board a company of thirty persons, Puritans, who had come to form a new settlement in the New Jersey wilderness. Before the landing was completed, the Hackensack Indians demanded compensation from the new comers, which they finally received. Subsequently another vessel arrived from Connecticut containing a somewhat larger party, but both together numbered, all told, less than seventy persons. Their chief desire was to establish a community whose spiritual and temporal affairs would be controlled and directed "according to God and a godly government." Their pastor was Abraham Pierson, originally from Newark-on-Trent, in whose honor the name of the settlement was changed from Milford to

Newark. The town was laid out in lots, and everything was ordered and governed mainly according to Mosaic law. The foremost among the settlers was Capt. Robert Treat, a brave, resolute, wise, and kindly man, who, after remaining long enough to see the new settlement fairly established, returned to Connecticut, and became governor of the colony. He had previously been deputy-governor for thirty-two years. The dream of Pierson and his Puritan followers was not realized. Before many years the Mosaic bars had to be removed one by one, and gradually the townspeople broadened their ideas of government. But even to this day, despite the cosmopolitan character of the population, the old Puritan leaven is still at work, largely affecting the whole lump.

The first occurrence of special interest in the history of the town after its settlement was a schism in the old church. Col. Josiah Ogden, a rich and influential member and a man of strong individuality, saved his wheat one dry Sunday in a wet season. He maintained that it was a work of necessity; the church declared it to be a violation of God's law. The immediate result was the withdrawal of Ogden and his followers, and the founding of the first Episcopal Church of England Society in Newark—Trinity church. The affair led also to an exacerbating controversy which lasted from 1734 until long after the Revolutionary war, which closed in 1783. Newark was, from 1748 to 1856, the seat of the college of New Jersey, thereafter permanently established at Princeton, founded by the Rev. Aaron Burr, father of the more celebrated American of the same name; the latter was born in Newark. During the war of independence, the great majority of the thousand inhabitants of Newark sided with the Americans; the town suffered severely from the ravages of the British and marauding parties of American loyalists; on the other hand the American revolutionists drove out all loyalists and confiscated their property. After the war manufactures began to prosper, and have continued to do so ever since. At one time chairmaking was carried on extensively, and it is stated that among those who worked at it in Newark was the famous Talleyrand.

NEWARK, a city of the United States, capital of Licking county, Ohio, is situated on the Licking river and on the Ohio and Erie Canal, and is thirty-three miles from Columbus by the railway to Pittsburgh. It is a flourishing agricultural and industrial center, with extensive railway shops, foundries, and manufactories of glass, paper, steam-engines, and agricultural implements; and sandstone quarries and coal-mines are worked in the neighborhood. Some of the most extensive and interesting of the earthwork remains of prehistoric inhabitants of North America are found here. The population was 3,654 in 1850, 6,698 in 1870, and 18,157 in 1900.

NEWARK, DAVID LESLIE, LORD, a celebrated Scottish military character during the civil war, was born in 1601. He was in 1661 created Lord Newark, and received a pension of £500 per annum. He died in 1682. The title became extinct in 1790.

NEW BEDFORD, a city and port of entry of the United States, one of the capitals of Bristol county, Mass., stretches for several miles along the west side of the estuary of the Acushnet river, which opens into Buzzard Bay, and forms an excellent harbor. It is fifty-six miles almost due south of Boston by the Old Colony Railroad. Of the fact that it has been for a long time one of the wealthiest cities in the State, New Bedford affords abundant indications in the character both of its private residences and of its public enterprises and numerous charitable institutions. French avenue, the favorite promenade, was laid out by the municipi-

ality in 1853; it runs four miles around the shore of Clark's Point at the mouth of the river, where the United States erected a granite fort in 1860-64. Since the decline of Nantucket New Bedford has been the great seat of the United States whale fishery; in 1854, when the enterprise was at its best, the New Bedford district possessed 410 whalers with a burden of 132,966 tons, but owing to the civil war and other influences (especially the immense production of petroleum) the number was by 1883 reduced to 95. The manufactories of the city, which on the other hand have been increasing in importance, produce cotton goods (value [1900], \$16,750,000), woolen goods, silver-plated and iron wares, drills for metal-workers, copper sheathings, Prussian blue, paraffin and other candles, glass, cordage, shoes, etc., the total value in 1900 being \$25,681,671. The population was 21,320 in 1870, 26,845 in 1880, and 62,442 in 1900.

New Bedford (Acushnet of the Indians) was settled by Quakers in 1664, but it did not receive its present name till about 1765. The present condition of the city may be seen from the following exhibit: Receipts of treasury, \$1,234,874.12; disbursements, \$658,523.20. Total city debt, \$1,455,164.93. Average property valuation, \$32,738,855. Charity expenditures, \$40,543.55. Four public cemeteries furnish burial facilities. Water-works expenditure, \$138,183.54. The public library contains 53,000 volumes. The fire department comprises 171 men, 6 steamers, 1 hand and 7 hose carriages, 1 aerial hook and ladder company, 2 common hook and ladder companies, 7 coal wagons and 1 telegraph wagon, 25 horses, 11,650 feet of hose, 56 call boxes, 29 miles of wire; cost of department, \$38,876.18. The school population, 7,332; number of schools, 25; teachers, 166. School fund, \$110,503.30; expenditures, \$110,442.98. Books are furnished to pupils, evening schools are maintained by the city; military training is given. The police force numbers 56—1 chief, 2 captains, 6 lieutenants, 47 patrolmen; cost, \$61,700.45. Charities fund, \$42,630.77; expended, \$40,543.55.

NEW BERNE, or NEWBERN, the capital of Craven county, N. C., and the port of entry of the district of Pamlico, is situated at the meeting of the Neuse and the Trent, on the Atlantic and North Carolina Railroad, 107 miles southeast of Raleigh. Vessels drawing eight and a half feet can reach the wharves at mean water-level, and steamers run regularly to New York, Baltimore, and Norfolk. Cotton, lumber, naval stores, fish, rice, corn, and early vegetables for the northern markets are the chief articles of trade. Tobacco factories, turpentine distilleries, candy factories, lumber-mills, a wooden-plate factory, a cotton-seed-oil factory, a rice-mill, and a cigar factory are the most noteworthy of the industrial establishments in the city. The population was 5,849 in 1850, 6,443 in 1880, and 9,090 in 1900. Founded by Swiss settlers in 1701, New Berne continued to be the capital of the province of North Carolina till 1793. It was captured by Burnside in 1862, and suffered from fire.

NEW BRIGHTON, a post-village in Richmond county, N. Y., is situated at the northeastern corner of Staten Island, six miles southwest of New York, with which it is connected by ferry. Best known as the seat of the Sailors' Snug Harbor, a fine building fronting the Kill von Kull, which was founded in 1831 for aged and disabled seamen of the port of New York. New Brighton also contains an asylum for destitute children of seamen, one of the largest dyeing and printing establishments in the United States, a silk-printing factory, a paper-hanging factory, etc., as well as many residences belonging to New York men of business. The population, including Tompkinsville and West

New Brighton, in 1880, was 12,079. Population (1890), 16,423.

NEW BRIGHTON, a post-village of Beaver county, Penn., lies on the Beaver river, three miles from its junction with the Ohio, and opposite Beaver Falls. The water-power of the river here is utilized, and there are considerable manufactures. The town has banks, churches, schools, railroads, and telegraph facilities. Population (1900), 6,820.

NEW BRITAIN, a city of the United States, in Hartford county, Conn., ten miles southwest of Hartford by the New York and New England Railroad. It is the seat of the State normal school (the new building erected in 1881 cost \$90,000), and has a public park of seventy-four acres, a public library, and a good water-supply from a reservoir 200 feet above the level of the streets. The principal manufactures are bronze goods, locks, builders' hardware, cutlery, knit woolen goods, carpenters' tools, and jewelry. In 1870 the population was 9,480; in 1880, 13,979; and in 1900, 25,998. Elihu Burritt was born at New Britain in 1811.

NEW BRITAIN (BIRARA) AND NEW IRELAND, two Polynesian islands, about 340 miles by 23, and 240 by 22 respectively, are separated from the southeast extremity of New Guinea by a strait, first ascertained to be such by Dampier, fifty-two miles wide. They form together a sort of horseshoe, divided in the middle by St. George's Channel, some twenty miles wide, which in 1878 was half-choked, temporarily, by pumice from a neighboring volcano.

NEW BRUNSWICK, a province of Canada, in British North America, is bounded on the northwest by Quebec; north by the Bay of Chaleur; east by the Gulf of St. Lawrence and Northumberland Strait, which separates it from Prince Edward Island; south by a portion of Nova Scotia, Chignecto Bay, and the Bay of Fundy; and on the west by the State of Maine. Its length from north to south is 230 miles, its greatest breadth 190, and it has a seaboard of some 545 miles, interrupted only by the isthmus of Chignecto, which joins the province to Nova Scotia. In shape it is very compact, resembling an irregular quadrangle. Its area is 28,200 square miles.

The surface is generally undulating, but in the northern and northwestern sections there are many ranges of hills which rise to a height of from 1,200 to 2,000 feet, while individual peaks are to be found of even greater altitude. These elevations are an extension of the Appalachian Mountains, and traverse the province from the State of Maine. The scenery is most picturesque and varied, and vast forests abound all through this section of country. The southern region embraces the district along the Bay of Fundy. Its coast is rocky and bold, and interrupted by great ravines. West of the river St. John the soil is fertile and rich, and, though toward the east it is not so deep, there is still a good agricultural country, with many beautiful valleys, grain fields, and forests. Along the shores on the east coast, and for twenty miles inland, the country is flat, and composed of mosses and marshes, but beyond that distance it rises into gently sloping hills, which extend as far as St. John.

The whole of New Brunswick is well watered. Rivers, bays, and lakes are numerous, and several are navigable for vessels of large tonnage. The principal rivers are the St. John, Miramichi, Restigouche, Saint Croix, Petitcodiac, Richibucto, and Nepisiguit. The St. John, which is famous for its scenery, rises in the State of Maine, and is over 450 miles in length. It is navigable for vessels of moderate tonnage from St. John on the Bay of Fundy to Fredericton, a distance of

about eighty-eight miles, but steamers of light draught ply as far as Woodstock, sixty-five miles farther, and during the rainy season boats may proceed to Grand Falls, a cataract seventy or eighty feet high, 225 miles from the sea. Above the falls the St. John has been navigated by a steamer to the mouth of the Madawaska, forty miles. The river is an important highway, especially of the lumber traffic. About 9,000,000 acres of New Brunswick, 2,000,000 acres of Quebec, and 6,000,000 acres of Maine lands are drained by it. Among the many lakes communicating with the St. John is Grand Lake, thirty miles long, and varying from three to nine miles in breadth. The Miramichi rises in the county of Carleton, and flows in a northeasterly direction into a bay of the same name. It is 225 miles long, 7 miles wide at its mouth, and navigable for large vessels as far as Nelson (46 miles). In the spring and autumn, when full freshets prevail, small steamers and towboats can ply a much greater distance. The branches of the Miramichi drain a fourth of the entire province. An extensive lumber trade is done in this district, and many sawmills are driven by the river. Its fisheries are specially valuable, including salmon, trout, bass, smelt, and lobster. The Restigouche forms the northeast boundary of the province, is 100 miles in length, and discharges into the Bay of Chaleur. It is composed of five main branches, from which fact it derives its name, signifying in Indian "the river which divides like the hand." It is a considerable waterway, three miles in width at its mouth, and nine fathoms in depth. Large vessels may safely navigate it eighteen miles from the bay. The main river and its tributaries drain over 4,000 square miles of fertile and well-wooded country. A good deal of lumber is carried on it, and the harbor is secure and safe for ships of ordinary tonnage. The St. Croix separates the State of Maine from New Brunswick at its southwest part. Its source is a chain of lakes called the Chiputneticook. The Petitcodiac is navigable for twenty-five miles for ships, and schooners of eighty tons burden may proceed to the head of the tide, twelve miles farther; it empties into Shepody Bay. The Richibucto discharges into the Gulf of St. Lawrence. The Nepisiguit and Tobique (a tributary of the St. John) in the north are in much repute among anglers.

The coast line of New Brunswick is indented with numerous fine bays and harbors. There are few islands. The Bay of Fundy is a huge arm of the sea extending into the land between New Brunswick and Nova Scotia, and terminating in two smaller bays, Chignecto Bay and the Basin of Minas. Its length up to Chignecto Bay is 140 miles, and its extreme breadth forty-five miles. It is noted for its high tides, which are influenced by the Gulf Stream, and rise about thirty feet at St. John and sixty feet at the head of Chignecto Bay, rushing into the latter with remarkable force. At Bay Verte, fourteen miles distant, the tide rises little more than four or five feet. The Bay of Chaleur, which presents no impediment to navigation, and has several excellent harbors, is over ninety miles in length, and from twenty to twenty-five miles in breadth. On its southern side the shores are low, and on the northern bold and precipitous. The other inlets of consequence on the east coast are Miramichi, Richibucto, Buctouche, Cocagne, and Shediac Bays; on the south coast are Passamaquoddy Bay, St. John Harbor, and Chignecto Bay.

The coal-fields of the province occupy an area of over 11,000 square miles, producing, in 1900, 17,630 tons. Iron and plumbago or graphite occur in workable quantities, the deposits of the former being extensive and valuable. Manganese abounds and forms an article of export.

The climate of New Brunswick is somewhat similar to that of the more southern parts of Quebec. It is subject to

pronounced extremes of heat and cold, but is considered healthy, and epidemics are rare. The winters are severe, and snow falls to a great depth, especially in the north, where also wild and cold winds prevail. In the south the winters are milder and more broken. The most charming season is autumn, and particularly that part of it known as the Indian summer, which lasts about six weeks.

Vegetation is rapid. A very large portion of the country is well adapted for agriculture, the soil being exceedingly fertile. On the "intervalles" or low lands enormous quantities of hay are grown, while the yield on the high lands varies from one to three tons per acre. Wheat, oats, buckwheat, rye, barley, hemp, and flax yield good crops, and potatoes, turnips, beets, celery, carrots, parsnips, and peas and beans grow well. The principal fruits are apples, plums, cherries, gooseberries, currants, strawberries, and raspberries. A large export trade of recent years has sprung up in the latter fruits. Hay has always been exported from the province to the United States, where it commands good prices. Farming is not prosecuted in New Brunswick to the extent it should be, and the inhabitants fail to raise enough produce to meet their own wants.

New Brunswick ranks as one of the most amply wooded countries in the world. Great forests of trees cover an extensive portion of its surface, and lumbering forms one of its chief industries. The principal trees are pine, hackmatack, spruce, cedar, beech, maple, hemlock, birch, fir, elm, oak, larch, butternut, ash, poplar, chestnut, and sumach. Though lumbering and fishing form the main occupations of the people, many are engaged in the mining and manufacturing industries. The total value of the produce of the forest yielded in 1900 was \$6,724,422; of the fisheries, \$3,769,742; of the mines, \$140,908; of animal and their produce, \$321,426; of agricultural produce, \$256,994; of manufactures, \$365,748. The total value of the exports (1901) was \$14,886,454, and of the imports \$6,741,848.

Shipbuilding, which was prosecuted on an extensive scale some years ago, has fallen off considerably of late, owing principally to the fact that iron ships and steamers have taken the place of the wooden craft in the carrying trade. During the year 1882 the number of vessels built in New Brunswick was sixty-six, tonnage 16,820. On December 31, 1882, the vessels registered in the province and remaining on the registry books of the several ports amounted to 1,064, tonnage 308,961. In that year there were engaged in the coasting trade, including steamers and sailing-vessels, 4,435 craft, representing a tonnage of 415,029. The number of saw-mills in the province is 470, employing 7,175 hands. There are also 166 flour and grist mills, and eighty-three tanneries. Other industries are lime-burning, shingle-making, manufacture of woolen cloth and cotton warps, cheese and butter making, sash, door, and blind factories, iron-working, and brickmaking. In 1901 the gross debt of the province was \$3,746,502, and the total assets amounted to \$700,238, including the Dominion Government's debt allowance. The debt of St. John, the chief city, was (1900) \$3,631,092; that of Fredericton, the capital, \$280,933.

The chief seats of the fisheries are in the harbor of St. John, on the islands at the mouth of the Bay of Fundy, and on the north shore. Cod, haddock, salmon, trout, sturgeon, halibut, whitefish, herring, shad, gaspereaux, smelt, bass, mackerel, and eels comprise the principal varieties taken. Of recent years the fishing business has been most industriously pursued, and several firms have gone extensively into the canning of salmon, oysters, and lobsters for export. Fish-breeding establishments are in operation, maintained by the

Government of the Dominion. In 1900 the value of fish catch of all kinds in the year was \$3,769,742.

Game is abundant—wild ducks, teal, wild geese, partridges, woodcocks, pigeons, plover, snipe, etc., appearing in large numbers. No fewer than 270 varieties of birds have been already discovered, and ornithologists state that that number can be increased. Of wild animals the principal are the bear, wolf, deer, moose, caribou, lynx, fox, muskrat, mink, marten, ermine, hare, squirrel, and beaver.

The province is divided into fifteen counties, viz., Restigouche, Gloucester, Northumberland, Kent, Westmoreland, Albert, St. John, Charlotte, King's, Queen's, Sunbury, York, Carleton, Victoria, and Madawaska. Up to October 31, 1882, 9,937,433 acres were granted by the government and occupied, leaving 7,455,977 acres still vacant. The population of the province, 285,594 in 1871, was 321,263 (164,139 males, 157,124 females) in 1881. Pop. (1901), 331,120.

A large proportion of the population is composed of emigrants from Great Britain and their descendants. In the northern counties and in the valley of the Madawaska there are many settlements of French Acadians, and in the same localities and along the shores of the St. John river there are Indians belonging to the Malicite, Micmac, and other tribes, numbering in all 1,401. During the last forty years these have varied from 1,200 to 1,400. The tribes, though resembling each other in physique and appearance, differ very materially in origin and almost wholly in language. The extent of land granted to the Indian population by the government of New Brunswick is 8,662 acres. Within the last six or seven years a most flourishing colony of Danes has been settled in the province.

The affairs of the province are administered by a lieutenant-governor (salary \$9,000) and an executive council composed of six members with portfolios and three without offices or salary, assisted by a legislative assembly of forty-one representatives and a legislative council of eighteen members. The latter are appointed for life, and the former are elected by the people every four years. The lieutenant-governor is appointed by the governor-general of Canada in council. New Brunswick returns to the Canadian House of Commons sixteen members, and ten senators are appointed by the crown. The public revenue in 1901 was \$1,031,267, and the expenditure \$910,346.

The present school law was passed in 1871. Under its provisions school trustees of each district are compelled to provide school accommodation for all persons therein between the ages of five and twenty, free of charge. The public charitable institutions receiving aid from the local government are the Provincial Lunatic Asylum and the City Hospital, St. John, and the deaf and dumb school at Fredericton; and the blind school and deaf and dumb asylum at Halifax, N. S., receive an annual grant from the province also. In consideration of this the latter admit pupils from New Brunswick. The lazaretto for lepers at Tracadie and the marine hospital at St. John are maintained by the Dominion.

NEW BRUNSWICK, a city of the United States, capital of Middlesex county, N. J., thirty-one miles by rail from New York, at the head of navigation of the Raritan river, and the eastern terminus of the Raritan and Delaware Canal. The older portion occupies the low land along the river, and has narrow, irregular streets; but the newer districts have spread over the higher grounds behind, and are both well built and well laid out. Conspicuous among the public buildings are Rutgers College and the theological seminary of the Reformed (Dutch) Church. The college was founded in 1770 as Queen's College, and received its present

name in honor of Col. Henry Rutgers (1746-1830) only in 1825. It has a library of 12,000 volumes, and 16 professors and 115 students. The seminary, dating from 1784, consists of eight fine buildings—Hertzog Hall, Suydam Hall, the Gardiner Sage Library (36,000 volumes), and five professors' residences—and occupies a good position to the north of the college. India-rubber goods, hosiery, paper-hangings, shoes, and machinery are manufactured on a large scale in the city. The population was 15,058 in 1870, 17,166 in 1880, and 20,006 in 1900. Settled in the close of the seventeenth century, New Brunswick was incorporated in 1736, and had become, by 1748, a "pretty little town with four churches and a considerable trade with New York." A city charter was obtained in 1784.

NEWBURG, or NEWBURGH, the capital of Orange county, N. Y., occupies a commanding position on the steep slopes of the west bank of the Hudson, about sixty miles north of New York. It has a large river trade, especially in coal and lumber, contains engine-factories, a cotton-mill, a bleachery, a lawn-mower factory, etc. Hasbrouck House, an old stone mansion which served as Washington's headquarters in 1782-83, has since 1850 been maintained by the State, and contains a considerable collection of historical relics. The population was 17,014 in 1870, 18,049 in 1880, and 24,943 in 1900.

The site of Newburg, then occupied by a clan of the Minis (Delaware) tribe, was recognized by Hudson in 1607 as a "pleasant place to build a town on;" but it was not till 1709 that the Palatine Parish of Quassaic, as it was at first called, was settled by a number of Germans from the Palatinate of the Rhine. In 1752 the name of Newburgh or Newburg was adopted from the likeness which the place bore to Newburgh on the Tay in Scotland. It was here that Washington rejected the proposal to make him king, thereby checking the incipient mutiny which the anonymous "Newburgh Letters" were designed to excite, and here the army was disbanded. A city charter was obtained in 1865.

NEWBURY, a municipal borough and market-town of Berkshire, England, near the Hampshire border, is situated on the river Kennet, the Kennet and Avon Canal, and the Great Western Railway, fifty-three miles west of London and sixteen southwest of Reading. Population (1901), about 14,000.

NEWBURYPORT, a city and port of entry of the United States, and one of the county-towns of Essex county, Mass., lies on the right-hand side of the estuary of the Merrimack, and thirty-five miles by rail north-northeast of Boston. At this point the river is crossed by several bridges, one of which, constructed in 1792, was the first suspension bridge in America. The ground on which the city is built rises gradually to a height of about 100 feet; along the top of the ridge, parallel with the river, runs for a distance of three miles High street, the leading thoroughfare, lined with old-fashioned mansions (Caleb Cushing's, Lord Timothy Dexter's, etc.); and at the junction of High street and State street is a pond of three and a quarter acres inclosed by a terraced promenade. The streets in general are umbrageous even for an American city, a special endowment having been left for the maintenance of shadetrees. Old South (Presbyterian) Church in Federal street contains a whispering gallery of a very striking kind, and under its pulpit lie the remains of George Whitefield. The free library, founded by Josiah Little in 1854, and endowed by George Peabody, occupies the old Tracy mansion, and contains upward of 21,000 volumes. Putnam Free School, dating from 1847, with an endowment of \$50,000, and the high school for girls, are both institutions of wide reputation (the latter the first of its

kind in the Union), now consolidated with the high school for boys. The cotton manufacture, introduced in 1836, is the staple of the city, which also, however, contains shoe factories (one of them said to be the largest manufactory of women's shoes in the world), an iron foundry, a distillery, carriage-works, hat factories, etc., and has long been the seat of extensive shipbuilding operations (tonnage 4,000 in 1882). The harbor (formed by the northern end of Plum Island, which is united to the city by a causeway) is of somewhat difficult access, owing to the shifting character of the bar, which becomes altogether impassable during storms from the east. The population of the city was 13,401 in 1860; 12,595 in 1870, and 14,478 in 1900.

NEW CALEDONIA, the largest island in the Pacific, after New Zealand, about 240 miles long, with an average breadth of twenty-five miles, lies at the southern extremity of MELANESIA (*q. v.*), and, like all the chief islands of that chain and the chain itself, runs northwest and southeast. It was discovered by Cook in 1774, and was appropriated by the French for a convict settlement in 1853. Their capital, Nouméa, with a fine harbor, is near the south end of the island. An almost unbroken barrier reef skirts the west shore at about five miles distance; on the east, which is more abrupt and precipitous, it is much interrupted. To the north the reefs continue, making the former extension of the land, for about 160 miles, ending with the Huon Islands. Huneá, or Isle of Pines, so called from its araucarias, geologically a continuation of New Caledonia, lies thirty miles from its southeast extremity. It abounded formerly in sandalwood, and consists of a central plateau surrounded by a belt of cultivation. New Caledonia consists essentially of confused masses and ranges of mountains, rising at Mount Humboldt to 5,380 feet, the plains being chiefly the deltas of rivers. The landscape is rich and beautiful, varied with grand rock scenery, the coast-line being broken by countless streams, often skillfully utilized by the natives for irrigation. The larger rivers in the wet season form impassable morasses. The framework of the island consists chiefly of argillaceous, serpentine, and mica schists. The famous nickel mines lie in the Kanala district, and extend for some sixty miles along the east coast, the rocks being coated with the green ore, which also occurs in pockets, and is extensively worked. There are also mines of copper and cobalt. In the low lying districts to the southeast are several lakes and morasses of black mud, and blocks of ironstone so abundant as to affect the compass.

The free white population, settlers and miners, numbers about 3,000; officials and troops, 3,000; transportés and déportés (ordinary and political convicts), with their families, 4,000 and 6,700 respectively. Some of the planters and graziers are fairly prosperous, but the material development of the country does not advance rapidly. Pop. (1900), with dependencies, 53,000.

NEWCASTLE, or in full, for the sake of distinction, NEWCASTLE-UPON-TYNE, a city (with the constitution of a county), municipal and parliamentary borough, market-town, and seaport in the county of Northumberland, England, is situated on the north bank of the river Tyne, eight miles above its mouth, and on the main line of the Northeastern Railway, 275 miles north of London and 70 east of Carlisle. The business portions of the town—principally erected from the plans of Richard Grainger—are characterized generally by spacious streets with imposing buildings and fine shops; and in the northern and western suburbs there are numerous terraces and villas inhabited by the wealthier classes. The important town of GATESHEAD (*q. v.*), on the south side of the river, is connected with

Newcastle by three bridges—a high level bridge, a hydraulic swing bridge, and a suspension bridge. About half a mile farther up the stream is the Redheugh bridge, commenced in 1867, and opened in 1871 at a cost of \$200,000. Newcastle is well supplied with public parks and recreation grounds.

The most important public buildings are the corporation buildings, including a large public hall, and a corn exchange, erected (1863) at a cost of \$500,000; the guild-hall, originally a hospital called the *Maison de Dieu*, and afterward used as "the stately court of merchant adventurers," reerected in 1658; the moot-hall (1810) for the meetings of assizes and sessions and the transaction of county business; the exchange (1860); the central news-room and art gallery (1838); the assembly-rooms (1774, reerected 1876); the barracks (1806); the market (1835); the central railway station, opened 1849, at a cost of \$620,000; the police courts (1874); the general postoffice (1876); the Wood memorial hall (1870), used for the meetings of the North of England Institute of Engineers; the custom-house; the theater royal; Trinity house, with a chapel dating from 1491; and the (branch) Bank of England.

The Grey monument in Grey street, an Ionic column surmounted by a statue of Earl Grey, was erected in 1836 to commemorate the passing of the Reform Bill; the Stephenson monument near the railway station was erected in 1862.

The principal educational establishments are the colleges of medicine and of physical science, affiliated to the university of Durham, the royal free grammar school, founded in 1525, and rebuilt by the town council in 1870 out of the funds of the hospital of St. Mary; the school of science and art in connection with South Kensington, opened in 1879; and Allan's endowed schools, founded in 1705, and reorganized by the charity commissioners in 1877. Among the clubs and similar institutions are the Literary and Philosophical Society, founded in 1793, possessing buildings erected in 1825 at a cost of \$80,000; the Society of Antiquaries, founded in 1813, with a museum in the castle; the Natural History Society; the Tyneside Naturalists' Club, established in 1846; the Mechanics' Institution, 1824; the North of England Institute of Mining Engineers, 1852; the Fine Arts Society; the Farmers' Club; the Northern Counties Club; the Union Club; and the University Club. There is a public library and news-room, erected at a cost of \$100,000. The benevolent institutions include the infirmary (originally founded in 1751 and enlarged in 1801 and 1851), the dispensary (1777), the fever-house (1803), the lying-in hospital (1760), the eye infirmary (1822), Trinity almshouse (1492), the hospital of the Holy Jesus (1682), the keelmen's hospital (1701), the female penitentiary (1831), the Royal Victoria asylum for the blind (1838), the Northern Counties institution for the deaf and dumb (1839), the Northern Counties female orphan institution, and the Philipson memorial orphanage for boys (1876).

Newcastle owes its prosperity to its convenient situation on a tidal river, and to the immense stores of coal in the neighborhood, which, besides being largely exported, have stimulated a great variety of industries which are dependent on their use.

In the annual statement of the shipping of the United Kingdom for 1882, the returns for the coasting trade are not given for Newcastle separately; but for the Tyne ports, which include, in addition to Newcastle, North and South Shields, the numbers were—entered with cargoes and in ballast 10,152 of 3,377,108 tons, cleared 8,214 of 2,361,248 tons. Within the present century the population of Newcastle has more than quadrupled. It amounted to 214,803 in 1901.

Newcastle owes its origin to the *Pons Ælii*, a Roman bridge constructed by the Emperor Hadrian. The most important relics of Roman occupation are a well in the center of the buildings of the old castle, a mutilated statue of Hercules and a figure of Mercury preserved in the castle, numerous coins, altars, and various specimens of Roman pottery. The foundations of the old Roman bridge, with the remains of the piers, were discovered during the dredging operations after the destruction of the old wooden bridge in 1771. On account of its position as a fortified town affording protection to the inhabitants of the monasteries of Tynemouth, Jarrow, Lindisfarne, and Wearmouth, Newcastle was known in early times as Monkceastre or Monckchester; along with these monasteries it was ravaged by the Danes, who massacred the monks and nuns within its walls. After the union of the kingdom under Egbert it continued till the Conquest to be the residence of the earls of Westmoreland and Northumberland. The town was destroyed by William the Conqueror in 1068, after he had defeated Edgar Atheling and Malcolm of Scotland on Gateshead Fell, but in 1080 a fortress was reared at it by Robert Courthose, eldest son of the Conqueror, which, in contradistinction to the old fortress, was named Newcastle, and formed the nucleus of the present town, burgesses being gathered round the fortress to defend the country against the Scots.

NEWCASTLE, a city of New South Wales, and the principal seaport of the northern coast, is situated on a steep acclivity rising from the sea, at the mouth of the Hunter river, about seventy-five miles north of Sydney. The population of the census district in 1900 was 16,170.

NEWCASTLE, a thriving post-borough of Pennsylvania, the capital of Lawrence county, two miles above the junction of the Shenango and Mahoning (subtributaries of the Ohio) and forty-five miles north-northwest of Pittsburgh. It contains blast furnaces, rolling-mills, iron and brass foundries, tube-works, boiler-works, machine shops, planing-mills, nail factories, glass-works, grist-mills, and breweries. The population increased from 6,164 in 1870 to 8,418 in 1880, and was returned at 28,339 in 1900.

NEWCASTLE-UNDER-LYME (or LYNE), a municipal and parliamentary borough of Staffordshire, England, is situated on a small stream, the Lyne brook, and near the Grand Trunk Canal, sixteen miles north-northwest of Stafford, and thirty-five south from Manchester. The population of the parliamentary borough was 15,948 in 1871, and in 1881 it was 17,493. The municipal borough, which was slightly increased in extent in 1877, had about 20,000 inhabitants in 1901.

NEWCASTLE, DUKES OF. Within the space of a century there were no less than four successive creations of dukes of Newcastle. William Cavendish, nephew of the first earl of Devonshire, was raised to the dignity of duke of Newcastle-upon-Tyne in 1664. His son and successor Henry died leaving daughters only, and one of these married John Holles, earl of Clare, who was created duke in 1694. This duke died also without male issue in 1711, leaving his estates to his sister's son, Thomas Pelham, who, with other dignities, had the title of duke of Newcastle-upon-Tyne conferred on him in 1715, and a second and similar ducal title (that of Newcastle-under-Lyme) in 1757. His first dukedom became extinct at his death, but the second title was granted him with remainder to the earl of Lincoln, at once his nephew and nephew-in-law, whose descendants (Pelham-Clintons) have been dukes of Newcastle-under-Lyme in direct lineal succession down to the present time.

NEW-CHWANG, a city of China, in the Manchurian province of Liau-tung (Shing-king or Fing-tien),

is situated about thirty-five miles (ninety miles by water) from the coast of the Gulf of Liau tung, on what is now a small branch of the main eastern affluent of the Liau-ho or Sua-muren. The city proper is a comparatively unimportant place with broken-down walls, but it is surrounded by a number of large and most flourishing suburbs. About the beginning of the present Ta-tsing dynasty (1644) New-chwang was the chief port on the river, but in the reign of Keen-lung, owing mainly to physical changes, it was supplanted by Tien-chwang-tai farther down the stream, and toward the close of the eighteenth century this had in turn to give place to Ying-tze still nearer the mouth. In ignorance of these facts New-chwang (now scarcely to be reached by a flat-bottomed river boat) was chosen as one of the ports to be opened to foreign trade by the treaty of Tien-tsin; and, though Ying-tze had of necessity to be adopted as the site of the foreign settlements, Europeans still continue to speak of the port of New-chwang. The port was opened to foreign trade in 1858. Pop. (1900), 45,000.

NEWCOMB, J. THOMAS, one of the inventors of the steam-engine, was a native of Devonshire, and was born about the middle of the seventeenth century. He died about 1713. (See STEAM-ENGINE.)

NEW ENGLAND is the northeastern portion of the United States, comprising the six States of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island. It formed part of the territory of "North Virginia" granted by James I. to the Plymouth Company in 1606; and in 1614 the name of New England was bestowed upon it by Capt. John Smith (1579-1631), whose *Description of New England* appeared at London in 1616.

NEWFOUNDLAND. This island, which is a British colony, lies off the eastern coast of North America, directly across the Gulf of St. Lawrence. Its southwestern extremity approaches within 50 miles of Cape Breton, while its most easterly projection is only 1,640 miles from Valentia, on the coast of Ireland. Its great length, from Cape Ray to Cape Norman, is 317 miles; its greatest breadth, from Cape Spear to Cape Anguille, 316 miles; and the total area about 42,000 square miles. Its figure roughly approaches an equilateral triangle. Two large peninsulas project from the main body of the island.

The part of the island near the sea consists of a hilly country with eminences of no great elevation. The interior proper consists of an elevated undulating plateau, traversed here and there by ranges of low hills, the surface being diversified with valleys, woods, lakes, ponds, and marshes. Much of this is a savanna country, sustaining vast herds of reindeer. All the great hill ranges take a northeasterly and southwesterly direction, the highest land occurring along the western and southern shores. The principal mountain chain, the Long Range, extends along the western side of the island for nearly its entire length, and has peaks more than 2,000 feet high, and parallel to this, but nearer the coast, is the Cape Anguille range. The peninsula of Avalon is very hilly; but the highest summits do not exceed 1,500 feet. The country is remarkable for a number of isolated sharply-peaked summits which rise abruptly here and there from the level plain, and bear the local name of "tolls."

The largest river is the Exploits, 200 miles in length, having a drainage area of between 3,000 and 4,000 square miles. It rises in the extreme southwestern angle of the island, and flows in a northeasterly direction through Red Indian Lake, terminating in the Bay of Exploits, Notre Dame Bay. The valley through which it flows contains large areas of fertile land, capable of yielding crops of all kinds, and in many

places is covered with pine forests containing timber of large growth. The next largest river is the Humber, which rises twenty miles inland from Bonne Bay, and after a circuitous course empties itself into Deer Lake, thence flowing into the Bay of Islands. It drains an area of 2,000 square miles. The Gander, which rises near the southern coast, and, flowing near Gander Lake, falls into Gander Bay on the east, has a drainage area of 2,500 square miles.

One of the most remarkable of the physical features of the island is the immense number of lakes and ponds, which occupy nearly a third of the whole surface. The largest is Grand Lake, fifty-six miles in length, and covering an area of 192 square miles. It contains an island twenty-two miles in length and five in breadth. Red Indian Lake is thirty-seven miles long and sixty-four square miles in area; Gander Lake and Deer Lake occupy thirty-three and twenty-four square miles respectively; Sandy Lake, Victoria, Hind's, Terra Nova, and George IV. Lake range next in size. The shores of these great lakes, and the fertile valleys through which their rivers flow, are as yet absolute solitudes, the very existence of which was until recently all but unknown.

The climate is more temperate than that of most portions of the neighboring continent. It is but rarely, and then only for a few hours, that the thermometer sinks below zero in winter, while the summer range rarely exceeds 80° Fahr., and for the most part does not rise above 70°. The Arctic current exerts a chilling influence along the eastern coast, but as a compensation it brings with it the enormous wealth of commercial fishes and seals which has rendered the fisheries the most productive in the world. The Gulf Stream, while it creates fogs, modifies the cold. The salubrity of the climate is evidenced by the robust, healthy appearance of the inhabitants. Open fireplaces are sufficient to warm the houses, and free exercise in the open air is attainable at all seasons. Winter sets in, as a rule, in the beginning of December, and lasts until the middle of April. Generally the snow lies during this period, and the frost rarely penetrates the ground to a greater depth than a few inches. Spring is sometimes late in arriving, but once vegetation sets in it advances with marvelous rapidity. The autumn is usually very fine, and is often prolonged till November. There is nothing in the climate to interfere with agriculture. Tornadoes are unknown, and thunderstorms are very rare. Fogs, of which so much is said in connection with the country, are confined to the shores and bays of the southeastern and southern coasts.

Among the well-known wild animals indigenous to the country the caribou or reindeer holds a conspicuous place. They migrate regularly between the southeastern and northwestern portions of the island. The winter months are passed in the south, where "browse" is plentiful, and the snow is not too deep to prevent them from reaching the lichens on the lower grounds. In March they begin their spring migration to the barrens and mountains of the northwest. In May or June they bring forth their young. As soon as the frosts of October begin to nip the vegetation they turn south. September and October are the best months for stalking. In addition to the caribou, the wolf and black bear are found in the interior; the fox (black, silver, gray, and red), beaver, otter, arctic hare, North American hare, weasel, bat, rat, mouse, and musquash or muskrat are numerous. The famous Newfoundland dog is still to be met with, but good specimens are rare, and he appears to thrive better elsewhere. The common dogs are a degenerate mongrel race. It is estimated that there are 300 species of birds in the island, most of

them being migratory. Among them may be enumerated the eagle, hawk, owl, woodpecker, swallow, kingfisher, six species of fly-catchers and the same number of thrushes, warblers and swallows in great variety, finches, ravens, jays. The ptarmigan or willow grouse is very abundant, and is the finest game-bird in the island. The rock ptarmigan is found in the highest and barest mountain ridges. The American golden plover, various species of sandpipers and curlews, the brent goose, ducks, petrels, gulls, and the great northern diver are met with everywhere. The great auk, now extinct, was once found in myriads around the island. The little auk, guillemot, and the razor-billed auk are abundant. No venomous reptiles, toads, or frogs occur. Of molluscous animals the common squid, a cephalopod about six or seven inches in length, visits the coasts in immense shoals in August and September, and supplies a valuable bait. A gigantic species of cephalopod was discovered in 1873, which excited much interest among naturalists; the body varies from seven to fifteen feet in length, with a circumference of five or six feet; from the head ten arms radiate, the two longest (tentacles) being from twenty-four to forty feet in length, and covered with suckers at their extremities; the other eight arms vary from six to eleven feet, and on one side are entirely covered with suckers.

The pine, spruce, birch, juniper, and larch of the forests of the interior furnish ample materials for a large timber trade as well as for shipbuilding purposes. The white pine grows to the height of seventy or eighty feet in some places, and is three or four feet in diameter. The mountain ash, balsam poplar, and aspen thrive well. Evergreens are in great variety. The berry-bearing plants cover large areas of the island. The maidenhair or capillaire yields a saccharine matter which is lusciously sweet. Flowering plants and ferns are in vast varieties, and wild grasses and clover grow luxuriantly. Garden vegetables of all kinds, and strawberries, raspberries, gooseberries, currants, etc., thrive well.

The fisheries constitute the grand staple industry of the country. The most important is that of the cod, which is the most extensive of the kind in the world. The cod are taken on the shores of the island, on the Banks, and along the coast of Labrador. The Bank fishery is now prosecuted chiefly by the French and by Americans, Newfoundlanders occupying themselves chiefly with the shore and Labrador fishery. The aggregate annual catch of cod at present in the North-American waters is estimated at 3,700,000 quintals, say 150,000,000 fish. The value at \$4 a quintal would be \$14,800,000. Nearly four-fifths of the entire returns of the Newfoundland fisheries arises from the cod fishery.

While the cod fishery does not show any marked advance in the quantities taken during the last thirty years, the market value of dried codfish has risen more than 50 per cent., and the average value of exported products of the fishery may be fairly reckoned at \$5,500,000 per annum. Adding to this the local consumption, we must place the entire annual value at \$6,364,000.

The last census showed that there were about 53,000 persons engaged in catching and curing fish out of a population exceeding 180,000. The French Newfoundland fisheries on the Banks and along the shores average from 400,000 to 500,000 quintals—the number of men employed being 5,000 to 6,000. The cod fishery has been prosecuted for about 400 years, but, notwithstanding the enormous drafts every year, to all appearance the cod are as abundant as ever.

Next to the cod fishery in value comes that of the seal, which is not more than eighty years old. At present the average annual value of the seal fishery is about \$1,100,000, being an eighth part of the entire exports.

The number of men employed is from 8,000 to 10,000. Steamers were first used in 1863, and now there are about twenty-five engaged, some of them from 400 to 500 tons burden; sailing-vessels are rapidly diminishing in numbers.

There are no finer salmon streams than those of Newfoundland, but no proper measures have been taken for their preservation, and in consequence such practices as closing the mouths of the rivers with nets at a time when the fish are ascending to spawn, and constructing weirs, traps, and dams, have been followed to such an extent that in many of the rivers salmon are almost exterminated. The average value of the pickled and fresh salmon exported, during the last twenty years, has been about \$106,000 per annum. Until recently the chief mode of curing the salmon was salting.

The chief seats of herring fishery are Fortune Bay, St. George's Bay, Bay of Islands, Bonne Bay, and the whole coast of Labrador. The finest fish are those taken off Labrador and the Bay of Islands. The value of herrings exported is \$358,359, and of those sold to the French and Americans as bait about \$150,000 per annum. Allowing 73,000 barrels for home consumption, at \$3 per barrel, the total value of the annual catch of herrings is \$727,359. But few halibut or haddock are taken. Within the last few years the exportation of preserved lobsters has increased rapidly. Lobster factories have been established at various points.

Up to a comparatively recent period the people of Newfoundland were so exclusively engaged in the fisheries that no attention was given to agriculture; and persons who were interested in keeping the inhabitants on the seacoast employed in fishing systematically represented the country as hopelessly barren. That this is not the case has been conclusively proved by the geological survey.

The first copper-mine was opened in 1864, and at the end of 1879 the customs returns showed that copper and nickel ore to the value of \$5,000,000 had been exported in the interval. At present Newfoundland stands sixth among the copper-producing countries of the world. The mines are all situated around the shores of the Bay of Notre Dame; and until the interior is opened by roads and railways this will be the chief scene of mining enterprise. Many other minerals besides copper have been found, such as lead (in many places), silver, and magnetic iron ore; gold was recently discovered in one locality. In St. George's Bay there are large workable seams of coal. Gypsum exists in great abundance in the Carboniferous region, especially at Codroy and around St. George's Bay. Marbles of almost every shade are found on various parts of the coast; limestone, granite of the finest quality, roofing slate, and building stones are abundant.

The earliest estimate of the resident population of Newfoundland was made in 1654, when the total amounted to 1,750. In 1680 it reached 2,280; in 1763, 7,000; in 1804, 20,000; in 1832, 60,000; in 1836, 75,094; in 1857, 124,288; in 1869, 146,536; and in 1874, when the last census was taken, the total population was 161,374. It is now (1900) 210,000. St. John's, the capital, contained a population of 15,000 in 1835, and in 1900 it was close on 30,000.

Education is conducted on the separate or denominational principle, each religious denomination receiving an amount for its elementary schools and academies proportionate to its numbers.

NEW GRANADA. The vast regions of the north-west of South America conquered by Spanish adventurers in the first half of the sixteenth century received from Quesada, one of the great leaders of the move-

ment, the title of the New Kingdom of Granada. It was not till 1718, however, that the Spanish Government granted the president of the colony, Pedroza y Guerro, the rank of viceroy; and at the desire of his successor, Jorge Villalonga, the honor was again withdrawn. In 1739 the New Kingdom of Granada was reestablished under a viceroy, whose authority extended over the provinces of Terra-firma (state of Panama), Cartagena (state of Bolivar), Santa Marta and Riohacha (state of Magdalena), Maracaibo, Caracas, Cumana, and Guiana (republic of Venezuela), Antioquia (state of Antioquia), Pamplona and Socorro (state of Santander), Tunja (state of Boyaca), Santa Fé (state of Cundinamarca), Neyva and Mariquita (state of Tolima), Popayan and Pasto (state of Cauca), and Quito, Cuenca, and Guayaquil (republic of Ecuador). In 1777 the provinces of Maracaibo, Caracas, Cumana, and Guiana were separated from the viceroyalty to form the captaincy-general of Venezuela. For the republic of Colombia (1820-30), the republic of New Granada (1831-61), and the United States of Colombia (1861 to the present time which have successively taken the place of the viceroyalty), see COLOMBIA.

NEW GUINEA, the largest island in the world (excluding Australia), lies immediately north of Australia. It is 1,490 miles long, with a maximum breadth of 430 miles, its area being about 306,000 square miles.

It was probably in Miocene times, if not later, united to Australia; the average depth of Torres Straits, which are eighty miles wide, is only eight or nine fathoms, and the maximum twenty-three-fourths of the distance being occupied by coral reefs, a prolongation of the great eastern barrier reef of Australia. At either end of New Guinea a few large islands, with a number of smaller islets, are only separated from the mainland by narrow channels. From difficulties connected with the navigation, the climate, and the people, the coasts are still imperfectly surveyed, while of the interior, relatively to its vast extent, very little is known.

The north coasts are sometimes level, as at parts of Geelvink Bay and the extensive delta of the great Amherst river, at Walckenaer and Humboldt Bays, and farther east toward Cape della Torre, near which, and near Huon Gulf, there are large rivers; otherwise the shores are steep-to, and apparently rising, with promontories jutting twenty to forty miles out, and some good harbors. There is no barrier reef off this coast. High distant mountains are observed at every opening, those toward the east rising in successive and highly fertile terraces to some 13,000 feet.

The climate of the coast is unhealthy, especially during the transition between the monsoons, which is long and irregular owing to the action of the high mountain ranges on these winds. The heat is tempered by the heavy rainfall, discharged by the northwest monsoon chiefly in the west and north; the southeast monsoon also is often wet, especially in the east and south districts. Torres Straits is healthier, though the heat is great and the amount of salt in the air is trying to many. From July to September the force of the southeast monsoon there is such that even steamers cannot always face it and the tide together.

The flora is mainly that of the Indian Archipelago, which predominates even in the islands of Torres Straits; but on the shores of the Gulf of Papua, and inland, Australian vegetation is represented by *Eucalyptus*, acacias, and *Pandanus*; and Australian types are found as far north as Humboldt Bay. Over great part of New Guinea dense forests prevail, clothing the mountains to a height of several thousand feet, the timber of enormous height, though the species are fewer than in the great islands of the archipelago. Among

cultivated plants are the banana, papaya, orange, sugar cane, maize, millet, taro (*Arum esculentum*), *Abelmoschus Manihot*, *Jambosa*, yams, sweet potato, and pumpkins, and among the Amberbaki the dry rice. The cocoa-palm grows everywhere; the sago-palm grows wild in abundance in the swamps, and in the northwest each hill tribe, apparently to avoid collisions, draws its supplies from a different district of the coast. They have also in the hills a tree called "sali," with top and pith resembling sago. Tobacco of good quality is brought down from the interior, and an illustrious antiquity is claimed for the plant by a tradition which describes it as the miraculous fruit of a woman named Heva.

New Guinea is very poor in *Mammalia*. The large animals reported by travelers may possibly be gigantic marsupials akin to those found fossil in the Queensland Pleistocene. The wealth and beauty of the avifauna are great. Count Salvadori gives 1,028 species, belonging to 321 genera, for the Papuan sub-region (*i.e.*, from the Solomon Islands westward to, but excluding, Celebes). Of these about 470 are peculiar to New Guinea and the adjacent islands, including Aru. The more numerous and important genera are preëminently Australian in character, with many species peculiarly developed. There is also, as might be expected, a considerable number of Malayan forms, some common to the whole region, some only found here and at other far distant spots in it. The most remarkable orders, besides the birds of paradise, which are only found in New Guinea and the neighboring islands, are the honeysuckers, flycatchers, parrots, kingfishers, and pigeons, all rich in special forms. Birds of prey are rare; vultures, pheasants, woodpeckers, and finches absent. Of snakes, which may migrate freely on floating timber, we find out of twenty-four genera (belonging to eleven families) six Oriental, four Australian, and only four specially Papuan; of lizards three families with twenty-four genera, of which only three are peculiarly Oriental, three Australian, six Papuan. The *Amphibia* (six families with eight genera), for which the salt water is a barrier, have no western affinities, and those not of wide distribution are almost exclusively Australian—a fact of obvious geological significance. The *Lepidoptera* are numerous and singularly beautiful, as are the *Coleoptera*, which Mr. Wallace says often display the metallic luster characteristic of the plumage of the New Guinea birds.

The population consists of a great number of isolated tribes, differing much in appearance and language. The level of civilization varies, but seldom reaches even the average Pacific standard.

They have no single name for New Guinea, nor any idea of its extent, only using terms signifying "great land," to distinguish it from the adjacent islands or from Australia.

The name Papua is a Malayan term signifying frizzled, in reference to the hair; and, as distinguishing the peoples so characterized from the Australians, the term "Papuan" is by some writers thought more suitable than "Melanesian," while equally distinguishing the race from the brown Polynesians. The type of man known as Papuan or Melanesian (see MELANESIA) is found here in its greatest purity, and appears to occupy the whole island excepting its east extremity. But among tribes occupying so wide an area, having little intercommunication, and with other races at no great distance, many deviations from the normal type must be expected, and in fact it is not very easy to define this type. Its leading characteristics are—a medium height; fleshy rather than muscular frame; color a sooty brown, varying, but decidedly darker than the

Malay; high but narrow and rather retreating forehead, with thick brows; nose sometimes flat and wide at the nostrils, but oftener hooked and "Jewish," with depressed point, a feature represented in their karwars or ancestral images; prognathism general, but not universal; lips thick and projecting, so as to make the chin seem retreating; high cheek bones; hair black, frizzly, trained into a mop. The appearance is thus negroid, and is said to resemble the population of the African coast opposite Aden. But in the Arfak mountains in the northwest, and at points on the west and north coasts and adjacent islands, very degraded and stunted tribes are found, with hardly the elements of social organization (possibly the aboriginal race unmingled with foreign elements), and resembling the Aetas or Negritos of the Philippines, and other kindred tribes in the Malay Archipelago. On the banks of the Fly river D'Albertis observed at least two widely differing types, those on its upper course bearing some resemblance to the tribes of the eastern coast. Here, wedged in among the ruder Papuans, who reappear at the extremity of the peninsula, we find a very different-looking people, whom competent observers, arguing from appearance, language, and customs, assert to be a branch of the fair Polynesian race. But there are obvious signs among them of much admixture of blood and they or their congeners again may easily have modified their neighbors immediately west of them, just as Malay and other influences have done on the other end of the island. Indeed the greater degree of intelligence and good looks observed at points along the north coast may be due simply to this cause. On the west coasts there is a semi-civilization, due to intercourse with Malays and Bughis, who have settled at various points, and carry on the trade with the neighboring islands, in some of which, while the coast population is Malay or mixed, that of the interior is identical with the people of the mainland. On the west coasts Mohammedan teaching has also some civilizing effect. Many of the tribes at this west end of New Guinea are, at all events in war time, head-hunters, and in the mountains cannibals. Cannibalism in fact is practiced here and there throughout New Guinea. The frequent hostility and mistrust of strangers are partly due to slave-hunting raids and ill-treatment by traders, but the different tribes vary much in character. The mountain tribes are usually despised by their coast neighbors as ruder and more destitute of resources, but when more numerous and fiercer, as in the south of west New Guinea, the tables are turned, and the coast people live in perpetual terror of their neighbors, who plunder and enslave them.

NEW HAMPSHIRE, one of the New England States, has an area of 9,336 square miles. Its boundaries are partly natural. On the west it is separated from the State of Vermont by Connecticut river; on the north from the province of Quebec by the natural ridge of the watershed between the St. Lawrence and the streams flowing south to the Atlantic; on the east from Maine by a straight line from Quebec to the source of Salmon river, thence by this river to the ocean, and southeasterly through the middle of the Isles of Shoals; the boundary on the southeast is the Atlantic; and that on the south is a line two and a half miles distant from and parallel to the lower Merrimack, until that river changes its course to due north and south, when the line runs magnetic west to Connecticut river. The general shape of the State is nearly that of a right-angled triangle, having the perpendicular 180 and the hypotenuse 190 miles long. The greatest width is 100 miles, from Chesterfield to the outermost of the Isles of Shoals.

The State lies on the Atlantic slope of the continent, forming part of the elevated belt bordering upon the

ocean which culminates in three mountain districts, viz., Newfoundland, the White Mountains, and the Black Mountains in North Carolina. It is also situated east of the Blue Ridge and its northerly continuation in the New York highlands and the Green Mountain range, both of which are distinct from the true Appalachians—the latter being west of the great Appalachian limestone valley, and well shown in the Catskill, Alleghany, and Cumberland Ridges and plateaus. The Atlantic and White Mountain ranges are comparatively short, consisting of obtusely-pointed summits of gneissic or granitic rocks, either arranged *en échelon* or scattered in irregular groups. The White Mountains group first becomes noticeable in northern Maine, reaching the height of a mile at Mount Katahdin, and continues at less elevation southwesterly to the New Hampshire line, where it rapidly rises to its culmination in Mount Washington (6,293 feet). The part of this mountainous area that lies within New Hampshire extends to about 1,400 square miles. It is continued southwesterly, much reduced in elevation, beyond Mount Moosilauke, along the highlands separating the tributaries of the Merrimack and Connecticut rivers, through New Hampshire and Massachusetts into Connecticut. The distinctive Montalban elevation is limited on the west and on the south by the Connecticut.

The geological reports published in 1878 show four important topographical features: (1) the mountainous ridge following the eastern rim of the Connecticut river basin along the longest straight line that could be drawn within the State; (2) the elevated White Mountain tract, just north of the middle of the territory; (3) the comparatively low country between the two elevated districts just noted and the sea, three-fourths of which, away from the foothills, scarcely exceeds 500 feet above the sea-level; (4) a mountainous district north of the White Mountains, occupying Coos county in New Hampshire, Essex county in Vermont, and an indefinite region in Maine near the Quebec line. The average elevation of the land in New Hampshire is estimated to be 1,200 feet above the sea. Of this more than one-half is situated below 1,000 feet, and about one-sixth exceeds 2,000 feet, and is comprised in the third area mentioned above. The average height of the Coos and Essex district will be found to exceed 1,500 feet. Mount Washington is the only mountain peak exceeding 6,000 feet; and eight others are above 5,000 feet (Adams, Jefferson, Clay, two Monroes, Madison, Lafayette, and Lincoln).

These elevations have produced a marked effect upon the climate and natural products. The greatest annual precipitation is along the Merrimack river, forty-four inches near Manchester and forty-six inches above Franklin. It is only thirty-five inches near the seacoast, and forty inches on the upper Connecticut. The greatest precipitation is therefore on the seaward side of the long mountainous ridge constituting the backbone of the State. The annual isothermal lines vary from 48° Fahr. at Manchester to 40° in Coos county and 25° upon the summit of Mount Washington.

No less than four faunal areas are recognized, known as the Alleghanian, Canadian, Hudsonian, and Labrador. The first enters New Hampshire from the south, and is limited on the north by the line of 600 feet altitude, which is not far from the isothermal line of 45° Fahr., or the winter average of 20° Fahr. and the summer average of 65° Fahr. A few distinctive animals are the red-headed woodpecker, humming bird, bobolink, Baltimore oriole, blue jay, the box and painted turtles, and the rattlesnake. Among plants which are employed to determine the northern limit of this district are the hickory or shellbark, chestnut, mountain laurel or

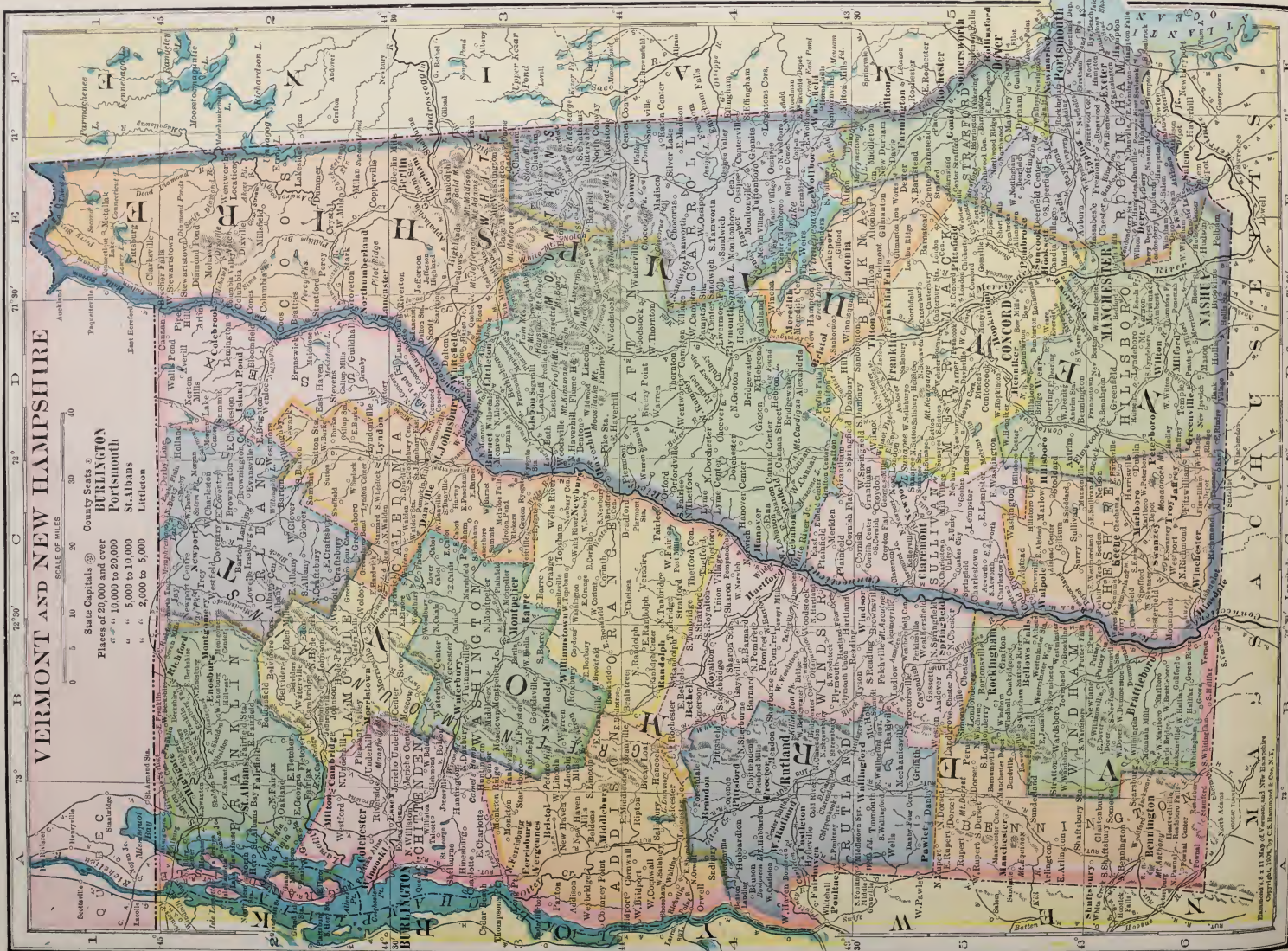
VERMONT AND NEW HAMPSHIRE

Scale of Miles
0 5 10 20 30 40

State Capitals
Burlington
Portsmouth

Places of 20,000 and over
10,000 to 20,000
5,000 to 10,000
2,000 to 5,000

County Seats
Burlington
Portsmouth
Littletown



73° 30' 72° 30' 71° 30' 70° 30' 69° 30' 68° 30' 67° 30' 66° 30' 65° 30' 64° 30' 63° 30' 62° 30' 61° 30' 60° 30' 59° 30' 58° 30' 57° 30' 56° 30' 55° 30' 54° 30' 53° 30' 52° 30' 51° 30' 50° 30' 49° 30' 48° 30' 47° 30' 46° 30' 45° 30' 44° 30' 43° 30' 42° 30' 41° 30' 40° 30' 39° 30' 38° 30' 37° 30' 36° 30' 35° 30' 34° 30' 33° 30' 32° 30' 31° 30' 30° 30' 29° 30' 28° 30' 27° 30' 26° 30' 25° 30' 24° 30' 23° 30' 22° 30' 21° 30' 20° 30' 19° 30' 18° 30' 17° 30' 16° 30' 15° 30' 14° 30' 13° 30' 12° 30' 11° 30' 10° 30' 9° 30' 8° 30' 7° 30' 6° 30' 5° 30' 4° 30' 3° 30' 2° 30' 1° 30' 0° 30' 0° 30' 0° 30'

73° 30' 72° 30' 71° 30' 70° 30' 69° 30' 68° 30' 67° 30' 66° 30' 65° 30' 64° 30' 63° 30' 62° 30' 61° 30' 60° 30' 59° 30' 58° 30' 57° 30' 56° 30' 55° 30' 54° 30' 53° 30' 52° 30' 51° 30' 50° 30' 49° 30' 48° 30' 47° 30' 46° 30' 45° 30' 44° 30' 43° 30' 42° 30' 41° 30' 40° 30' 39° 30' 38° 30' 37° 30' 36° 30' 35° 30' 34° 30' 33° 30' 32° 30' 31° 30' 30° 30' 29° 30' 28° 30' 27° 30' 26° 30' 25° 30' 24° 30' 23° 30' 22° 30' 21° 30' 20° 30' 19° 30' 18° 30' 17° 30' 16° 30' 15° 30' 14° 30' 13° 30' 12° 30' 11° 30' 10° 30' 9° 30' 8° 30' 7° 30' 6° 30' 5° 30' 4° 30' 3° 30' 2° 30' 1° 30' 0° 30' 0° 30' 0° 30'

Kalmia, grape, and cranberry. A few characteristic animals of the Canadian district are the rose-breasted grosbeak, Canada jay, spruce partridge, crossbill, snow-bird, caribou, and Canada lynx; the absence of reptiles is marked. A few of the trees are spruces, balsam fir, canoe birch, and bush maples. This district, comprising the northernmost county, reaches the height of 4,000 feet, or the upper limit of trees. The Hudson district is a region of dwarfed spruces, extending above the Canadian upper limit to the 5,000 feet line, and limited to the White Mountains. None of the larger animals which flourish about Hudson's Bay could be expected in such limited and mountainous peaks, so that the proof of the presence of this fauna is afforded by the plentiful distribution of the butterfly known as *Brenthius montinus* and the grasshopper *Pezotettix glacialis*. Owing to the small areas occupied by the Hudson and Labrador floras in the White Mountains, botanists have not yet succeeded in separating the plants peculiar to each. Fifty-three species are referred to them, called the sub-alpine and alpine districts, embracing such genera as *Arenaria*, *Geum*, *Solidago*, *Potentilla*, *Nabalus*, *Cossiope*, *Rhododendron*, *Salix*, *Saxifraga*, *Diapensia*, *Carex*, *Poa*, etc. The Labrador fauna is specially characterized by the abundant presence above the 5,000 feet line of the butterfly *Oeneis Semidea*. The presence of the faunal islands in the midst of the Canadian district is accounted for by the greater coldness of the climate in the glacial period. The whole country was then overspread by the peculiar animals and plants of the arctic regions. As the climate moderated these organisms migrated both northward and upward into the higher districts, where they found the conditions favorable to their existence. Those which ascended the mountainous regions soon became separated from their congeners by the warmer temperature of the lowlands, and are now securely imprisoned in these mountain fastnesses.

New Hampshire was originally nearly covered by a dense forest. In 1876 it was estimated that more than one-fourth of the territory was still covered by trees, not of the original growth, but occupying land that had not been cleared. The trees valued for lumber, growing naturally in the forest, are the red, white, and pitch pines, spruces, hemlock, larch, red and sugar maple, beech, birch, red and white oak, chestnut, elm, hickory, poplar, cherry, etc. The pines have been described by the early settlers as commonly exceeding the height of 200 feet. One that was cut upon the Dartmouth College grounds measured 270 feet in length.

The population of New Hampshire in 1890 was 376,530 (180,526 males, 196,004 females)—46,294 being of foreign birth. The growth of the population is shown by the following table:

	Popu- lation.		Popu- lation.
1790.....	141,885	1840.....	284,574
1800.....	183,858	1850.....	317,976
1810.....	214,460	1860.....	326,073
1820.....	244,042	1870.....	318,300
1830.....	269,328	1880.....	346,991

Census returns (1900) show a pop. of 411,588.

The decrease in the decade ending with 1870 was due to the effects of the civil war and to the emigration to other States. The latter cause greatly checked the growth of the preceding decade. So constant has it been that 128,505 natives of New Hampshire are resident in other parts of the Union. The density of population is 37.17 to the square mile, but the southern part of the State is more thickly inhabited. The tendency of the population is toward the towns. Of the total

increase in that decade (28,691, of whom 58 per cent. were immigrants), nine towns received 20,649, Manchester alone gaining 9,094. Canada supplied the largest number of immigrants (14,979), and Ireland the next (6,544). Since 1850 the native population has decreased. The number of families in 1880 was 80,286, and the number of births 6,141, one to 56.5 of the inhabitants, and the deaths 5,584. The average size of families was 4.32, the smallest average of any State in the Union, though larger than in a few of the new Territories. It is steadily decreasing.

The principal industry of New Hampshire is manufacturing. The most important manufactures, mentioned in the order of the value of their products, are those of cotton and woolen goods, boots and shoes, leather, lumber, mixed textiles, and worsted goods. Other valuable manufactures are hosiery and knitted goods, paper, foundry and machine-shop products, flouring and grist mill products, and malt liquors. There is a large annual cut of logs in the northern part of the State. The value of the wool products, in 1900, was \$10,381,056, of cotton-goods products, \$22,998,249. Manchester is the chief manufacturing center, but large mills are built at Dover, Nashua, and Great Falls. The growth of manufactures in New Hampshire has been steady and constant. The first cotton mill was built in 1804. By 1826 there were fifty different buildings for the manufacture of cotton, and about half as many for that of wool. In 1900 the capital invested in manufacturing was over \$100,000,000; the total wages paid was \$30,000,000; the value of products, \$118,669,308.

The value of the agricultural productions of the State is about one-fifth of the manufactures. The following is the crop report for 1899:

PRODUCTS.	Quantity produced in 1899.	No. of acres in each crop.	Total valuation.
Indian corn.....bushels	1,080,720	25,694	\$538,738
Wheat	4,035	271	3,428
Rye	5,320	350	3,529
Oats	497,100	12,589	184,025
Barley	46,680	1,596	25,189
Buckwheat	43,360	1,835	19,334
Potatoes.....	2,420,668	19,422	1,090,495
Hay and forage. tons	654,973	615,042	6,336,252
Forest products.			2,299,327

Minerals occurring in sufficiently large quantities to be the object of mining are gold, silver, copper, zinc, lead, arsenic, tin, iron, bismuth, manganese, and molybdenum. Articles used for building purposes occurring largely are granite, colored porphyries for ornamentation, slate, clays for brick, limestone, and soapstone or steatite. Other useful minerals either obtained directly from the rock or capable of special manufacture are quartz and felspar for glass, mica, plumbago, precious stones, whetstones, coppers, alum, pyrites, titanium, polishing powder, molding sand, and others for paints. There are forty extensive quarries of granite in the State. The stone is very fine grained, of a light gray color, and is used largely for obelisks in cemeteries. The mineral beryl is very abundant. Crystals weighing 2,900 pounds have been described as occurring at Grafton.

The first railroad charter was granted in 1735. Since then the growth of railroads has kept pace with the development of the State, the mileage in 1901 (1,190) being greater in proportion to population and wealth than in the case of any other New England State. The Mount Washington Railway is one of the triumphs of modern

engineering. Extending two and three-quarters miles from the base to the summit of Mount Washington, it makes an ascent of 3,625 feet. Its maximum gradient is 1,980 feet to the mile, and the sharpest curve has a radius of 497 feet. The peculiarity is a central cog-rail into which plays the cog-driver of the engine, while the weight rests upon two lateral rails.

The first bank in New Hampshire was established at Portsmouth in 1792. In 1890 there were in the State fifty National and other banks with a capital of over \$7,000,000. The first savings bank was established in 1823. They now number sixty-five. Every banking company pays annually to the State a tax of $\frac{1}{2}$ per cent. on its actual capital, and the amount thus paid constitutes a "literary fund" for the support of schools. All are under the supervision of two bank commissioners, whose duty it is to inspect the accounts and securities of each bank at least once each year, and who have power to petition the supreme court against any bank which they think unsound. Total funded debt of State June 1, 1900, \$1,118,793. Valuation for 1899, \$252,570,803; tax, \$400,000; gross revenue, 1900, \$1,627,271, and gross expenditures, \$1,170,741; debt of counties, \$495,175. Population, 411,588. Valuation per capita, \$608.18. Tax per capita, \$1.06.

The State constitution, adopted in 1784, contained a clause, still in force, making it the duty of "legislators and magistrates to cherish the interests of literature and the sciences, and all seminaries and public schools." In 1789 the school laws were revised, and towns required to raise for school purposes \$20 for every \$5 of their several apportionments of the State tax. This requisition has been gradually increased, until now it is \$350 for each dollar of the apportionment. In 1805 the towns were authorized to divide into districts, and each district was directed to maintain a school. This system, with modifications, is still in force. Towns are now authorized to abolish districts and form central schools, and to grade them when the attendance exceeds fifty. High schools may be established when there are not less than 100 school children between the ages of six and sixteen. In 1829 the "literary fund" was divided among the towns according to the apportionment of the State tax for the support of "common free schools, or for other purposes of education." To the tax on bank capital is added one on the savings banks deposits of non-residents. The general supervision and control of the educational interests of the State are committed to a superintendent of public instruction appointed by the governor. The immediate charge of all schools is given to local boards of education or committees, which, within the requirements of the law, have complete authority to engage teachers and fix their compensation, to regulate the studies and discipline of the schools, and to direct their expenditures. Attendance upon the public school or some reputable private day school for at least twelve weeks in a year is required, except in cases of sickness, of all children between the ages of eight and fourteen. In 1900 there were 1,902 public schools, with 65,193 scholars enrolled and 47,733 in actual attendance, and 3,114 teachers. The number of school-houses was 2,078; value of school property, \$3,658,143. Nearly \$1,000,000 was raised by town and district taxes for the schools. The schools are supported by the literary fund, the tax required by law, with the additional taxes voted by the towns and a few other taxes. There are also, existing under special charters, fifty-three academies and seminaries, many of them endowed, and furnishing a preparatory training for college. The largest of these is Phillips Academy at Exeter, founded in 1781. Dartmouth College, the only college in the State, was founded in 1709. It has nearly 9,220

graduates, among whom are some of the most noted names in American history. With its academic course are connected a scientific department, a department of civil engineering, the New Hampshire Medical College, and the New Hampshire College of Agriculture and the Mechanic Arts.

The executive department consists of a governor and five councilors elected biennially by a majority vote, or by the general court when there is no popular election. In addition to the usual powers of the executive, the governor and council have the right of pardon, and appoint all judicial officers, the attorney-general, notaries, coroners, judges of probate, and general and field officers of the militia. The legislative department consists of a senate of 24 members, elected by districts, and a house of representatives of 231 members, elected by the towns according to population. They are styled the General Court, and meet biennially in June. The judicial department is a supreme court consisting of a chief justice and six associate justices appointed by the governor, and holding office during good behavior, or till they reach the age of seventy. Law terms are held twice each year at the capital, by the full bench, and by single justices two or four times yearly in each of the ten counties. This court has civil, criminal and equity jurisdiction. Exceptions on questions of law, taken at the trial terms, are heard at the law terms, and cases not exceeding \$100 in value, or affecting the title to real estate, may be tried before referees without jury. Commitments for offenses are made by justices of the peace and by police courts. Probate courts are held by the judges of probate in the different counties, but there is a right of appeal to the supreme court. All native or naturalized male inhabitants of the State, except paupers, are entitled to vote. The State is represented in Congress by two senators and two representatives, and has four votes in the electoral college.

New Hampshire was unknown to the earliest European explorers of America, who passed its short seacoast without observation. The first recorded visit of a white man was that of Martin Ping, who, in June, 1603, sailed with two small ships into the Piscataqua. The French discoverer De Champlain visited it in July, 1605, and discovered the Isles of Shoals, but in 1614 Capt. John Smith made a more careful examination of this and the contiguous coast. The map which he made was presented to Prince Charles of England, who gave the whole country the name of New England. In November, 1620, James I. chartered the Plymouth Company "for the planting, ruling, ordering, and governing of New England," which was the territory lying between the 34th and 48th parallels of north latitude. On August 1, 1622, this company gave a sub-charter to Sir Fernando Gorges and Capt. John Mason of all land lying between the Merrimack and Kennebec rivers and a line supposedly sixty miles inland. This was called "Maine," though from another charter covering about the same territory sometimes spoken of as "Laconia." Under this charter settlements were made in 1623 at the places now known as Portsmouth and Dover, by companies sent out by Mason and Gorges. These continued for several years without enlargement, mere fishing and trading posts; and the next settlements, those at Exeter and Hampton, were not made till 1638 and 1639. In November, 1629, Gorges and Mason divided their grant, and Mason obtained from the Plymouth Company, of which he was then a member, a grant of the land between the Merrimack and the Piscataqua for sixty miles inland. To this tract he gave the name of New Hampshire, from the county of Hampshire, in which he had been a resident. The efforts of Mason, his heirs and assigns, to enforce the proprietary rights of

this patent, gave rise to litigation that lasted more than a century and a half. The settlers disturbed in their possession resisted his claim, opposing to it the rights of occupancy and a prior deed of a considerable portion of the same land, said to have been obtained of four Indian sagamores in May, 1629, by one Wheelwright, a minister expelled from Boston for errors of doctrine. This deed was probably a forgery, but it was made the basis of resistance to Mason's grant. Cases arising from the conflict of the two deeds were repeatedly brought before the colonial courts and appealed to England. Conflicting decisions, resisted when adverse to those in possession, delayed settlement till 1746, when a company purchased the Mason claims, and by refraining from the extreme assertion of their claims brought the quarrel nearly to an end, but it did not wholly disappear till it was settled by the legislature in 1787. In 1641 the four New Hampshire settlements, fearful of their weakness, voluntarily petitioned for union with Massachusetts. They were received, and with some towns on the Merrimack formed into a county. This union continued till 1680, when the claim which Massachusetts had put forward for jurisdiction over New Hampshire, by the terms of its charter, was denied by royal authority, and New Hampshire was declared a separate province, with a governor of its own. The province ceased to have a special governor when Joseph Dudley was appointed governor of New England in 1685. In 1691, when Massachusetts regained the charter of which it had been deprived, New Hampshire was anxious to unite with it, and did act with it for a time. It did not, however, cease to be a royal province until the Revolution, having governors of its own, or jointly with Massachusetts and all New England. New Hampshire suffered severely in the French and Indian wars, as its settlements were most exposed to the attacks that came from Canada. It furnished 500 men for the siege of Louisbourg in 1745, of whom 150 were paid by Massachusetts. It sent 500 to the attack on Crown Point in 1755, and raised 2,600 in the succeeding years of the war. The boundaries of New Hampshire, owing to conflicting charters given in ignorance of the country, were long a matter of dispute. The claim of Massachusetts to its whole territory was not settled, and the southern boundary definitely established, till 1740. In 1749 a controversy arose with New York, which claimed as far east as the Connecticut river, while New Hampshire claimed to extend as far west as did Massachusetts. It was determined in favor of New York in 1764, but not till New Hampshire had chartered 138 towns in the disputed territory. After the Revolution many of these towns attempted to unite with those on the western border of New Hampshire into a new State. The bitter quarrel that arose and proceeded almost to bloodshed was settled only by the interposition of Congress. The settlement of New Hampshire, which had been retarded by fears of Indian invasions and questions of jurisdiction, followed very rapidly after the province was quieted, so that by the outbreak of the Revolution it had 80,000 inhabitants. It took a prominent place in the assertion of American liberty. It was represented in the successive Continental Congresses by two delegates, who in 1776 subscribed the Declaration of Independence, and, in 1787, contributed to the formation of the constitution. Two New Hampshire regiments took part in the battle of Bunker Hill. The battle of Bennington, that turned the scale of the war, was won by New Hampshire and Vermont troops under the command of General Stark, who bore a commission from New Hampshire. In the whole war New Hampshire furnished 12,497 soldiers. It was the ninth State to adopt the Federal constitution,

June 21, 1788, thus securing the success of the Union. Its own provisional government, formed on the retirement of the royal governor in 1775, was replaced by a State constitution in 1784. This was thoroughly revised in 1792, and with minor changes continued till 1877, when another, though less radical, revision was made. In the war of 1812 the State, though divided on the question of the rights of the States and the general government, sent its quota of men. More than 2,000 took part in the various battles. In the civil war of 1861-65 New Hampshire earnestly supported the Union cause. It furnished eighteen regiments of infantry, one of cavalry, one light and one heavy battery, and three companies of sharpshooters, in all 32,750 men, or about 10 per cent. of the population.

NEWHAVEN (anciently MEECHING), a seaport of Sussex, is situated on the English Channel, near the mouth of the Ouse, and on a branch of the London, Brighton and South Coast Railway, fifty-six miles south from London, six and a half miles south of Lewes, and eight and a half east of Brighton.

NEW HAVEN, a city and town of New Haven county, Conn. (local time sixteen minutes before that of Washington), is widely known as the seat of Yale College. The town includes the city and two outlying suburbs—Westville and Fair Haven East. The city occupies an alluvial plain, from three to four miles in breadth, at the head of New Haven harbor, which is an indentation of the northern shore of Long Island Sound, extending inland about four miles, and formed by the confluence of three small rivers flowing through the township; the plain is partly inclosed on the east and west by two prominent trap rocks, with precipitous faces toward the city, respectively 360 and 400 feet in height. The mean annual temperature is 49° Fahr.; and the city ranks among the healthiest in the United States. It is seventy-four miles northeast from New York, with which it is connected by rail, as well as by daily steamboats; it has communication by three railway lines with Boston, 120 miles to the northeast, and two other railways have their termini here.

The central and older portion of the city is laid out in regular squares, surrounding a public green of sixteen acres, on which stand the ~~three~~ ^{largest} oldest churches and a building formerly used as a State-house; the abundance and beauty of the elms planted about this square and along many of the streets has caused the place to be familiarly known as the "Elm City." On the squares bordering upon this central park are the interesting grounds and buildings of Yale College, the city hall and county court-house, the postoffice and custom-house, and several churches. The college buildings include six dormitories for the undergraduate academical department, and there are thirteen buildings for recitation-rooms, laboratories, museums, library, etc. The handsome buildings of the theological department are in the immediate vicinity. Other public buildings are the general hospital and training school for nurses, an armory, the orphan asylum, the almshouse, the county prison, the halls of the Sheffield Scientific School, the college observatory, and the Connecticut Agricultural Experiment Station. The finest private residences are in the section of the city north of the central square. There are ten smaller squares within the town limits, and two private parks, of fifty-five and thirty acres respectively, the smaller being the college athletic grounds. A beautiful park of 352 acres (partly in an adjoining town) was opened in 1881; it lies two miles to the northeast of the city green. The public buildings include sixty-one places of worship, of which nineteen belong to the Congregationalists, the only denomination in the town for a century after its settlement; twelve to the Method-

ists, first organized here in 1795; eleven to the Protestant Episcopal Church, first organized about 1736; seven to the Baptists, who formed a church here in 1816; and seven to the Roman Catholics, whose first church was erected in 1834. There are thirty-six public schools. Twenty-nine schoolhouses owned by the town, with their furniture and grounds, represent an outlay of about \$675,000. There are also about twenty private schools, the oldest being the Hopkins Grammar School, founded in 1660.

The harbor, which originally determined the site of the city, and has always been a large factor in its prosperity, is large and safe, though shallow, and is under improvement by the construction of a costly breakwater. Long Wharf, begun in 1682, is 3,480 feet in length, the longest pier in the United States. Natural oyster-beds formerly abounded in the harbor and its tributary streams; and extensive beds are still maintained by planting, which give large returns, and make New Haven the chief center of the important oyster trade of Connecticut. The harbor is still more valuable in its relation to the extensive manufacturing industries of the vicinity. Within the radius of the city not less than \$30,000,000 is employed in the manufacture of the various industries. For this New Haven is the commercial center, and through its port there annually passes merchandise (largely coal and iron) valued at \$175,000,000. The foreign trade is chiefly with the West India Islands and Demerara, and its prosperity dates from the latter part of the eighteenth century.

In the production of carriages and wagons, the city of New Haven, which is the chief seat of the trade in New England, employs a capital of perhaps \$1,672,000; nearly 750 workmen receive annual wages of about \$600,000; and the estimated value of the yearly product is \$1,750,000. Another important industry is represented by the Winchester Repeating Arms Company, which, with a capital of \$1,000,000, employs 1,200 hands, and does a business in sporting guns and ammunition of about \$2,500,000 a year. Another noticeable manufacture is that of superior blotting paper from cotton waste; blotting paper was made here for the first time in America in 1856. The other principal manufactures are locks, rubber, clocks, organs, corsets, fish-lines, and paper boxes. There are nine banks of deposit, with an aggregate capital of \$4,664,000, and a circulation of \$3,038,940; also three savings banks, with deposits of about \$9,000,000. About \$225,000 is annually paid in New Haven in fire insurance premiums, for the protection of property valued at upward of \$25,000,000.

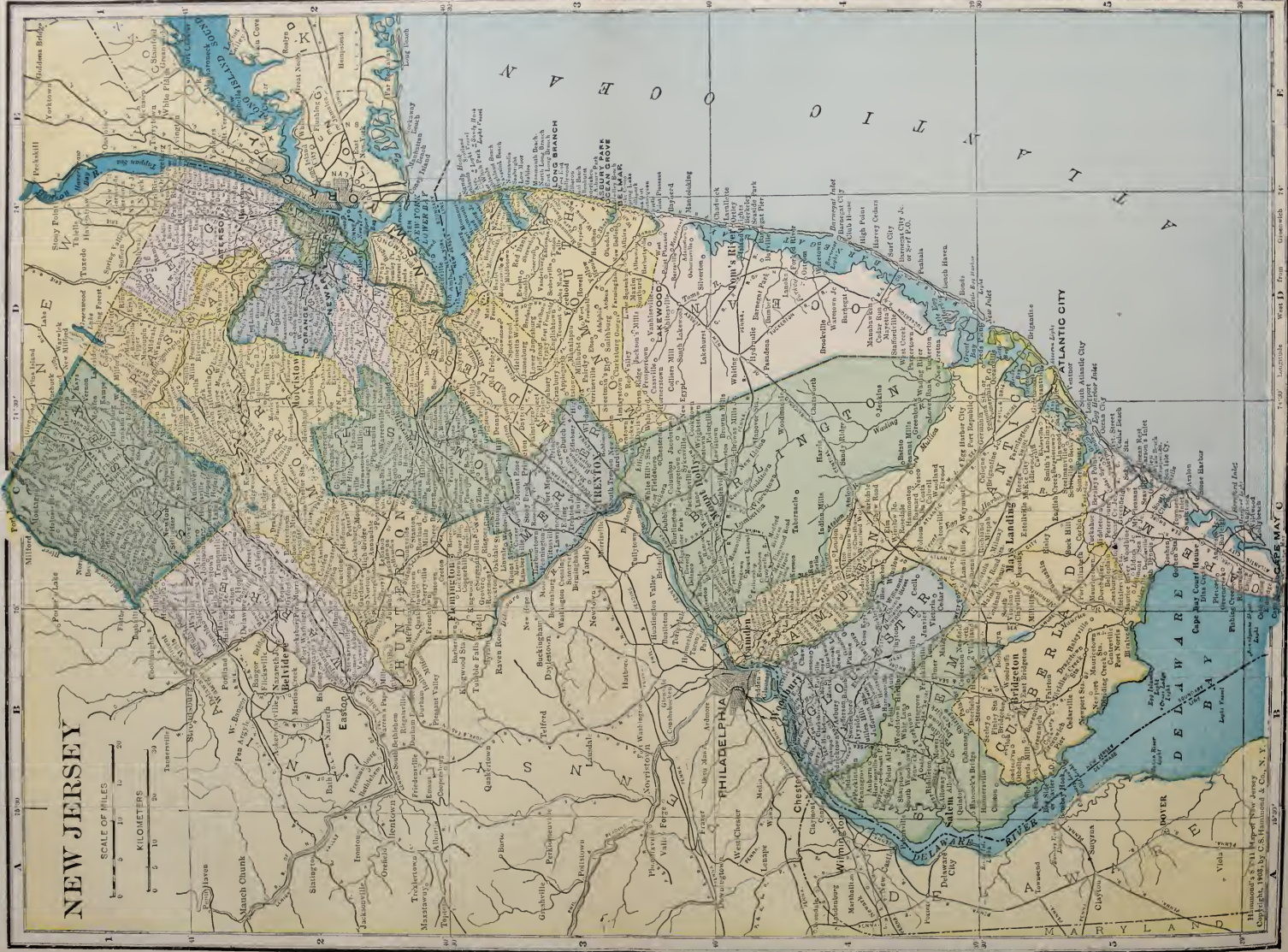
New Haven (Indian name Quinnipiac, meaning "long-water land") was settled in 1638 by nearly three hundred English emigrants of more than the average wealth and business ability, led by John Davenport and Theophilus Eaton, with the design of founding a commercial colony to be governed by the laws of the Bible. Davenport, an Oxford graduate, and for fourteen years a minister in London, became the pastor of the New Haven church; and Eaton, a successful London merchant, was the first governor of the colony which grew up about the town. The colony (of the same name) included five other towns, and remained independent until merged, by a charter of Charles II., in 1662, in the older colony of Connecticut; this result was largely due to the waning prosperity of New Haven (in contrast with Connecticut), and to the prejudice against its more rigidly Puritan tone, as shown, for instance, in its code of laws, and in such incidents as the shelter given to Whalley and Goffe, two of the regicide judges. In recognition of its former standing,

the sessions of the legislature were held alternately here and in Hartford (the original capital of Connecticut) from 1701 to 1784. From the original territory of the town (about thirteen by eighteen miles) ten new towns have been wholly or partly taken. New Haven was from the beginning distinguished for its care of public education—a free school being ordered to be set up as early as 1641, and the establishment of a college being contemplated in 1648. In 1710 Yale College was removed from Saybrook to New Haven, which had then somewhat under a thousand inhabitants. A period of quiet and regular growth ensued. In 1754 a printing press was set up, and in 1755 the first newspaper published in Connecticut appeared here. There are now six daily and six weekly papers, besides several college periodicals, *The American Journal of Science*, founded in 1818 by Professor Silliman, and another review (*The New Englander*). The Connecticut Academy of Arts and Sciences, incorporated in 1799, and the American Oriental Society, have their libraries here, and publish valuable transactions. In the American Revolution the town favored resistance to the British Government, and in 1779 was invaded by a detachment of about 3,000 British troops, under General Tryon. In 1784 New Haven received a city charter (the earliest in the State), the territory incorporated having then a population of about 3,350. With the close of the Revolutionary War commerce revived and expanded; and after the war of 1812 manufactures were introduced.

The population numbered, in 1790, 4,510; in 1800, 5,157; in 1810, 6,967; in 1820, 8,327; in 1830, 10,678; in 1840, 14,396; in 1850, 22,529; in 1860, 39,267; in 1870, 50,840; in 1880, 62,882; and 108,027 in 1900. The receipts of the city treasury for 1889 were \$611,176.93; expenditure, \$709,820.20; funded debt, \$974,000. Rate of taxation, 11½ cents. The city maintains a police department at a cost of \$118,000, and a fire department at a cost of \$85,000. The city is divided into twelve wards, and is governed by a mayor and twenty-four aldermen (twelve elected yearly) and thirty-six councilmen.

NEW HEBRIDES AND SANTA CRUZ. These islands form part of the long chain of groups in the west Pacific known as the MELANESIA (*q.v.*), having the Solomon Islands about 200 miles west and northwest of their northern and New Caledonia at the same distance west of their southern extremity. They extend for about 700 miles, the Santa Cruz group lying about 100 miles north of the New Hebrides. Excepting the small Torres group in the North New Hebrides, and some other small islands north of Santa Cruz which are all perched on reefs, but without lagoons, all the islands are of volcanic formation, the larger ones lying on both sides of the line of volcanic activity. The largest of them, being thought by its discoverer, Quiros (1606), to be the long-sought Terra Australis, was named by him Australia del Espíritu Santo. It is seventy-five by forty miles; its peaks and mountains have a fine appearance from the sea. Southeast from Espíritu Santo lie Mallicolo (fifty-six by twenty miles), with a fine harbor, and Ambrym (twenty-two by seventeen miles), very beautiful, with a great volcano, 2,800 feet; south of this Lopevi, a perfect volcanic cone, also active, rises to 5,000 feet. Farther south are Vaté or Sandwich Island (thirty by fifteen miles), with the very fine harbor of Havannah; Erromango (thirty by twenty-two miles; 3,000 feet), where sandalwood is still found; Tanna (eighteen by ten miles), containing Yasowa, the largest volcano of the group; and Aneiteum, the most southerly (2,788 feet). Sulphur from the volcanoes is exported. Santa Cruz or Nitiendi Island was the scene of Mendaña's ill-fated attempt, in 1595, to found a col-

NEW JERSEY



Copyright 1907 by the United States Government
Published by the War Department, Office of the Chief of Engineers
Washington, D.C.

any, and on Vanikoro, south of Santa Cruz, La Pérouse's expedition was lost (1788). Except in the two localities above mentioned, and at Aneiteum, the coasts are almost free from reefs (the subterranean heat being probably fatal to zoöphyte life), and the shores rise abruptly from deep water, the hills being densely wooded, and the scenery and vegetation singularly varied and beautiful. The trees—*Casuarina*, candle-nut (*Aleurites triloba*), kauri pine (on Tanna), various species of *Ficus*, *Myrtacea*, and many others—are magnificent; the cocoa-nut is not confined to the coast, but grows high up the valleys on the hill-sides. Beautiful crotons and dracænas abound. Besides the bread-fruit, sago-palm, banana, sugar, yam, taro, arrowroot, and several forest fruits, the orange, pine-apple, and other imported species flourish; and European vegetables are exported to Sydney. The fibers of various *Urticeæ* and *Malvaceæ* are used.

No land mammals are known except the rat and *Pteropida*. Birds (species) are less numerous than in the Solomon Islands. Pigeons, parrots, ducks, and swallows are common, and a *Megapodius* is found. Of fish more than one hundred kinds are known, mostly inferior as food, and some poisonous. Whales and bêche-de-mer abound and are fished for. There are two kinds of serpents (harmless), three or four lizards, and two turtles; locusts, grasshoppers, butterflies, and hornets are numerous. The population is perhaps 50,000.

NEW IRELAND. See NEW BRITAIN.

NEW JERSEY. The State of New Jersey, one of the original colonies which formed the United States of America, is bounded on the east by the Hudson river, Staten Island Sound, Raritan Bay, and the Atlantic Ocean, on the south by Delaware Bay, on the west by the Delaware river, and on the north by the State of New York, their common boundary being a straight line from the west bank of the Hudson river in latitude 40° north to a point on the north bank of the Neversink river at its junction with the Delaware. The extreme length is 167 $\frac{3}{4}$ miles, and the width ranges from 59 to 32 miles; and the State has an area of 7,576 square miles, and is divided into 21 counties and 223 townships.

New Jersey lies entirely on the Atlantic slope of the United States. In the north and northwest it is traversed by the Appalachian chain; the Red Sandstone belt, intersected by trap dykes, and extending from Massachusetts to South Carolina, occupies the central portion; and the lower half of the State is a part of the level sandy tract, covered with pine woods, which borders the Atlantic from New York to Florida.

The ridges of the Appalachian chain in New Jersey may be grouped in two main ranges—the Blue or Kittatinny Mountains and the Highland range. The first of these is an almost unbroken ridge from the New York State line to the Delaware Water Gap, and is the highest ground in the State, being at the Water Gap 1,479 feet above the sea, and at High Point, near the New York line, 1,800 feet high. Its level crest is clothed with forests, but the slopes are to a great extent cultivated. The Highland range, on the other hand, consists of a number of detached ridges, the highest of which is 1,488 feet above the sea. These vary greatly in their surfaces; many admit of cultivation to the summit, while others are so covered with loose stones or bare rock that cultivation is impossible. The mineral wealth of the range is considerable. The southern half of the State is a great plain, containing tracts of gravelly loam largely used for market gardens and vineyards. Extensive tidal marshes border the Atlantic and Delaware Bay, to the extent of nearly

300,000 acres. The Delaware river and bay receive all streams flowing from the western half of the State; the Passaic and Raritan are the most considerable rivers entirely within New Jersey. In the northwestern part are many beautiful lakes abounding with fish; the largest is Lake Hopatcong, five and one-half miles long by four and one-third to one and one-quarter miles wide.

The entire seacoast is rapidly becoming a continuous line of summer resorts, among which may be enumerated Long Branch, Sea Bright, Spring Lake, and Asbury Park in the northern portion, Atlantic City in the center, and Cape May in the south. Some of these places, as Atlantic City, are frequented even during winter months.

Although, according to the census of 1880, only the thirty-fifth among the thirty-eight States in area, it was the nineteenth in population, the eighth in the value of property, and twenty-fifth in value of agricultural products, the sixth in manufacturing and mechanical industries, while in some industries, as silk, pottery, and glass, it far exceeds any other State. The output of the non-precious minerals places it seventh in the list of States, it being the fourth among the iron-producing States, and first as to zinc ore. It has 2,257 miles of railways, or one mile to every four square miles of area, exceeded in this by only one State. The average value of farming lands is considerably above that of any other State.

The following is the crop report for 1899:

PRODUCTS.	QUANTITY.	ACRES.	VALUE.
Corn..... bushels	10,978,800	295,258	\$ 4,533,473
Wheat..... "	1,902,590	132,571	1,347,650
Oats..... "	1,601,610	75,959	492,341
Rye..... "	831,410	68,967	442,446
Buckwheat..... "	234,275	15,762	120,479
Potatoes..... "	4,542,816	52,896	2,192,456
Sweet potatoes..... "	2,418,641	20,588	1,213,010
Orchard fruits..... "	6,168,480	80,634	2,594,981
Hay and forage.... tons	542,796	444,610	5,544,970

Omitting fishery products, gas, petroleum, refining, mining, and quarrying, the following table gives the general condition of the manufacturing interests of the State in the years mentioned:

	No of Estab- lishments	Capital.	Hands Em- ployed	Wages Paid.	Cost of Material.	Products.
1850	4,207	\$22,293,258	37,830	\$9,364,740	\$22,011,871	\$39,851,256
1860	4,173	40,521,048	56,027	16,277,337	41,429,100	76,306,104
1870	6,636	79,606,719	75,552	32,648,409	103,415,245	169,237,732
1900	15,481	502,824,082	257,865	129,777,651	360,945,843	611,748,933

The population of the State was 211,149 in 1800; 277,426 in 1820; 373,306 in 1840; 672,035 in 1860; 1,131,116 in 1880; and 1,444,933 in 1890. The census of 1900 showed 941,760 males and 941,999 females; 1,812,317 white, 60,844 colored, 1,393 Chinese, and 52 Japs. The inhabitants of foreign birth numbered 431,884. To every square mile of area there were 250.3 inhabitants, the State being the third in the Union in respect of density of population. In 1900 the population as shown by the United States census was 1,883,666.

The largest cities are Newark, Jersey City, Paterson, Camden, Hoboken, Trenton (the State capital), Elizabeth, New Brunswick, Orange.

The executive power is vested in a governor elected by the people for a term of three years; no one can serve in this capacity two successive terms. The legislative power is in the legislature, composed of a senate and general assembly meeting on the second Tuesday of January each year at Trenton, the capital of the State.

A senator is elected for three years by each of the twenty-one counties, one-third of the whole number being elected each year. The assembly consists of not more than sixty members, elected for one year, and apportioned among the counties as nearly as may be according to the number of their inhabitants, with the condition, however, that each county shall at all times be entitled to one member. The principal officers of the State are a secretary of state, attorney-general, adjutant-general, and quartermaster-general, all appointed by the governor and confirmed by the senate, and a treasurer and comptroller appointed by the legislature in joint meeting. All judges and prosecutors of the pleas are appointed by the governor and confirmed by the senate; the election system for the judiciary has not yet reached New Jersey.

The judicial power is vested in (1) a court of errors and appeals in the last resort, consisting of the chancellor, the justices of the supreme court, and six judges of the court of errors; (2) a court for the trial of impeachments, consisting of the senate; (3) a court of chancery, consisting of the chancellor and two vice-chancellors; (4) a supreme court, consisting of the chief justice and eight associate justices; (5) circuit courts, held in every county by the justices of the supreme court; (6) an inferior court of the common pleas organized in each county, and consisting of three judges. In some of the sparsely settled counties the inferior courts are presided over by justices of the supreme court; in the other counties one of the three judges is a law judge and presides. The court of pardon consists of the governor, the chancellor, and the six lay judges of the court of errors; a majority of this court, of whom the governor must be one, can remit fines and forfeitures, and grant pardons, after conviction, in all cases except impeachments.

Among the most important manufacturing interests of the State are those given in the following table, for 1900:

KIND OF INDUSTRY.	Capital.	Average yearly Products.
Chemicals	\$17,284,675	\$12,207,289
Electrical apparatus	7,380,139	6,447,154
Foundry and mach.-shop products	31,550,687	32,621,229
Glass	5,397,662	5,093,822
Iron and steel	19,971,609	24,381,699
Jewelry	5,523,452	7,379,777
Leather, tanned and curried	9,906,119	13,747,155
Liquors, malt	26,330,466	14,386,456
Petroleum refining	23,332,426	29,649,460
Rubber and elastic goods	6,078,755	8,458,274
Sewing machines, etc.	4,317,666	6,643,348
Cotton goods	14,399,291	6,930,766
Dyeing and finishing textiles	11,600,695	10,488,963
Silk and silk goods	29,285,792	39,966,662
Woolen goods	4,549,798	4,755,393
Worsted goods	12,080,721	6,823,721
Tobacco, smoking and cigars	8,003,163	10,435,974

There are two lunatic asylums—one near Trenton, the other near Morristown; the latter is probably unsurpassed by any similar institution; there are also seven county asylums. An institution for the deaf and dumb has been established at Trenton; the blind and feeble-minded are placed in suitable establishments. The home for disabled soldiers, at Newark, accommodates nearly 400 men. The State expended for charities in 1890, \$362,641.95. The State prison at Trenton contains on an average some 800 convicts, a large part of whom are employed in contract labor to an extent which pays about 54 per cent. of the cost of the institution. A reformatory school for boys is situated near Jamesburg. An industrial school for girls, near Trenton, has forty-seven inmates. The board of health is steadily gaining in importance, and has accomplished much good

in spreading useful information, collecting important vital and health statistics, and investigating matters affecting the public health. The labor bureau has done good service in collecting statistics affecting the questions of labor and capital, in bringing about a better understanding between the two, and in indicating new and profitable avenues for industry. The geological survey, of which the geodetic and topographical surveys have necessarily formed part, now approaching its close, is one of the most useful of the State institutions.

The Agricultural College, attached to Rutgers College at New Brunswick, is supported by the proceeds of certain public lands given by the United States to the State for that purpose. In connection with this are the college farm and the agricultural experiment stations, which are doing admirable work in systematic and carefully conducted experiments (under the chief of the geological survey) with various fertilizers, and in testing various soils, crops, and methods of agriculture. The public schools are mainly supported by a State tax, supplemented by an annual appropriation of \$100,000 from the school fund. Small additional special taxes are also levied in some of the school districts. A normal school has been in successful operation at Trenton for several years, and has a large number of pupils. The college of New Jersey at Princeton, and its sister theological seminary, although not State institutions, occupy places in the very front rank of American schools of learning. The State Library at Trenton contains 36,000 volumes.

Total debt of the State (1900) was only \$19,000, while to meet this there were \$713,242 in the sinking funds. Valuation, \$649,979,700. Valuation, per capita, \$441.29. Gross receipts, year ending November 1, 1900, \$3,453,296; expenditures, \$2,701,226. Balance on hand October 31, 1900, \$752,070.

The first settlement within the present State was made in 1617 by the Dutch at Bergen, opposite New York. Subsequently, Cornelius May, who discovered the Delaware in 1623, built a fort on its banks opposite Philadelphia. During the early colonial period the region was the scene of many petty struggles arising out of the rival efforts of the Dutch, Swedes, and English to establish trading posts and settlements on the river. The Indians among whom these early settlers were thrown were generally divided into small tribes; but in the valley of the upper Delaware were the principal and most populous seats of the Leni Lenape—known by the English as the Delawares, a name still retained by the remnants of this most interesting and once powerful tribe in their new homes west of the Mississippi. On the whole the early intercourse between the whites and Indians was peaceful, but there were occasional collisions, some of a serious nature, too often brought about by the rapacity and bad faith of the whites. As a rule the title to the Indian lands was purchased, and after the province fell into the hands of the English the general policy pursued was one of humanity and good faith. At the time of the English accession it is estimated that the Indians in New Jersey numbered about 2,000.

When Charles II. wrested their North American possessions from the Dutch—in fact before this was accomplished—he granted them in bulk to his brother, the duke of York, who in turn granted what is now New Jersey to Lord John Berkeley and Sir George Carteret, the conveyance (June 23, 1664) providing that "the said tract of land is to be called Nova Casarea, or New Jersey." The royal grant was of the proprietary character, that is, it not only conveyed the absolute estate and title to the land, but also the power to govern and rule, and therefore to establish such laws as "might be thought necessary, provided they were not

contrary to, but as near as conveniently might be, agreeable to the laws, statutes, and government of the realm of England." As all these rights and powers were assignable, the duke transferred to Berkeley and Carteret, not only the lands, but also the power to govern; and they in turn possessed, and finally exercised, the power to assign to others both land and power to govern. A form of government was accordingly established in a "concession and agreement" issued by them. The governor was appointed by the proprietors, and he appointed a council of from six to twelve members; the governor and council united formed the executive. The freeholders of the province elected not less than twelve representatives, who, with the governor and council, composed the general assembly, in whom rested the legislative power, limited only by the terms of the "concession," especially the article securing entire liberty of conscience. The general assembly established the courts of justice, and took all measures necessary to preserve order and provide for the general defense; they regulated commerce, and determined the time and duration of their own sessions; they possessed the entire power of taxation, and it was required that the executive should neither impose nor suffer to be imposed any tax other than those imposed by the general assembly. The right of petition to the lords proprietors was secured to the freeholders. The first governor was Philip Carteret, a brother of Sir George, who arrived with a number of "adventurers" in August, 1665, and established himself at Elizabethtown. Upon the capture of New Amsterdam by the English, their commander, Colonel Nichols, assumed the administration of the entire territory in the name of the duke of York. Ignorant of the grant to Berkeley and Carteret, Nichols at once offered inducements to settlers from New England and Long Island to move into New Jersey, advising them to purchase the Indian titles, and promising immunity from ground rents. In consequence of this promise, which occurred before Carteret's arrival, serious difficulties afterward arose.

The first general assembly met at Elizabeth, May 26, 1668; another session was held during the same year, but none other for seven years thereafter. In 1672 New Amsterdam and New Jersey were reconquered by the Dutch, but early in 1673 they reverted to England. Doubts arising as to the effect of the reconquest upon the validity of the original grant, the duke of York obtained a new grant from the king, and renewed his own to Berkeley and Carteret. Prior to this renewal the two proprietors had agreed to a division of their interests, and in the new grant the portion assigned to Carteret was the region east of a line drawn from Barnegat Creek to the Rancocas; to Berkeley was assigned the territory west of that line. In 1676, however, the line of separation was changed by the owners, so that it extended from Little Egg Harbor to a point on the Delaware in 40° N. latitude; this remained thereafter the boundary between East and West Jersey.

Immediately after the reconquest Philip Carteret returned to East Jersey as its governor, and on his arrival in 1674 presented a new charter, less liberal in many respects than the original. Berkeley meanwhile sold West Jersey to a firm of Quakers, who at once proceeded to colonize it, establishing their first settlement at Salem in 1675, and another shortly after at Burlington. For some years great annoyance was experienced in both East and West Jersey from the unjust interference of the governor of New York, and of the duke himself, with their internal affairs; these attempts were always met by a firm and spirited resistance, which eventually triumphed. In 1682, soon after Sir George

Carteret's death, a society of Quakers under the lead of William Penn, encouraged by their success in West Jersey, purchased from his heirs their rights to East Jersey. It will give some idea of the progress already made to state that at this early period (1682) a smelting furnace and forge were in operation in New Jersey, making good iron, and that contemporary documents show that at the same date there were exported "great plenty of horses, beef, pork, pipe-staves, boards, bread, flour, wheat, barley, rye, Indian corn, butter, and cheese to Barbados, Jamaica, and other adjacent islands, as also to Portugal, Spain, the Canaries, etc.; whale oil, whale fins, beaver, mink, raccoon, and martin furs to England."

Toward the close of the seventeenth century the number of proprietors in the two provinces increased so much as to render good government impracticable in consequence of the discord arising from divergent interests and views. The evil became unendurable, and in 1702, by the general consent of the proprietors and people, the former, while retaining all their property rights, surrendered their right of government to the crown, by whom the two provinces were reunited, and placed under a governor appointed by the sovereign. With him were associated in the government twelve councilors selected by the crown, and twenty-four assemblymen selected by the freeholders. The sessions of the assembly were at the pleasure of the governor, and its acts subject to the double veto of governor and crown. The governor and council organized the courts of law, determined all salaries, and appointed all civil and military officers.

The population of the two provinces at this period was probably a little more than 15,000. The great majority of the people were Quakers, Presbyterians, and Anabaptists; there were only two Church of England ministers in the province, and their followers were too few and poor to provide churches; nevertheless the Church of England was now made the established church, and its support provided for. Liberty of conscience was permitted to all except Roman Catholics. Quakers were eligible to office. The governor enjoyed the right of presentation to ecclesiastical benefices.

Lord Cornbury was the first governor appointed under the new arrangement, and the commission and instructions which he received, the chief points of which have just been given, formed the constitution and government of New Jersey until the Declaration of Independence, except that New York and New Jersey had the same governor until 1738, after which year each had its own governor, and in New Jersey the council became a separate branch of the legislature, the governor no longer participating in the debates. From the beginning of Cornbury's administration to the Revolution the political history of the province consisted largely of violent contests between the assembly and the governor and his council—the latter constantly striving to extend the prerogative and curb the power of the people, and the assembly maintaining a bold and able contest in defense of the principles of liberty. Notwithstanding the large proportion of Quakers among its early inhabitants, New Jersey never failed to furnish its just quota of men and money for the various American wars waged in the eighteenth century, and its contingent bore a most honorable part in the chief military events of that period. For the campaigns of 1711, 1739, 1746, 1747, and 1748, the province supplied a battalion of 500 men. It was during these last campaigns that the name "Jersey Blues," in vogue since that time, was first applied to the Jersey troops from the color of their uniform—blue faced with red, gray stockings, and buckskin breeches. They were described at the time as

"the likeliest well-set men who ever entered upon a campaign." When the French war of 1754 broke out Jersey again furnished a battalion of 500 men; of these one-half were captured by Montcalm at Oswego, after a gallant resistance, and the remainder at the surrender of Fort William Henry. But the province at once made good the losses, and maintained as many as 1,000 men in 1758, 1759, and 1760, in which last year its contingent took part in the capture of Montreal. In 1761 and 1762 the contingent was 600 men, and again in 1764 for service against the Indians.

During the years immediately preceding the Revolution New Jersey took an active and leading part in all the discussions and measures growing out of the attempt of parliament to impose stamp duties and taxation upon the colonies without their consent. The province was ably represented at the various meetings of the Continental Congress preceding and leading to the war of the Revolution, and from the breaking out of hostilities bore more than its full share of the burdens necessary to bring the war to a successful conclusion. The last provincial assembly was prorogued in December, 1775. The Provincial Congress, elected in accordance with the ordinance of the preceding Congress, convened in June, 1776, and on July 18th assumed the title of the "convention of the State of New Jersey." An act of Assembly of September, 1877, substituted the word "State" for the word "Colony" in all cases of writs, commissions, indictments, etc., etc. In the war New Jersey furnished to the "continental line" 10,726 men, besides large numbers of militia, and expended for war purposes, on account of the continental government, \$5,342,770. Some very important and interesting operations of the war were conducted within the limits of the State; and from its peculiar position New Jersey suffered more from the evils of the war than any of the thirteen original colonies, except, perhaps, South Carolina. In the whisky insurrection of 1794 the State furnished more than 2,000 militia, who under General Howell formed part of the army in Pennsylvania. In the war of 1812 it furnished 7,000 militia, and in the Mexican war three companies of regular infantry and a battalion of volunteers. At the breaking out of the civil war of 1861 the number of men available in the State for military duty was 98,806; and during that war New Jersey organized and maintained thirty-seven regiments of infantry, three regiments of cavalry, and five batteries.

NEW JERUSALEM CHURCH. See SWEDEN-BORG.

NEW LONDON, a city and port of entry of the United States, one of the county towns of New London county, Conn., lies on the west bank of the Thames, about three miles above its entrance into Long Island Sound. It is the southern terminus of the Central Vermont Railroad, and a station on the New York, New Haven and Hartford and the New York, Providence and Boston Railroads, whose trains cross the river by ferry. By rail it is 126 miles from New York and 62 from Providence. The city is built on a declivity facing the southeast, and from the higher point enjoys fine views over Long Island Sound and the surrounding country. To the south lies Fort Trumbull. At Groton Heights, on the opposite bank, a small battery occupies the site of Fort Griswold, near which is a granite shaft, 127 feet high, commemorating the massacre of its garrison by Arnold's troops in 1781. As a fashionable summer resort, rivaling Newport, it is well provided with both private residences and public hotels. The city hall, the county courthouse, and the custom-house are among the most conspicuous buildings. The harbor of New London, the best on Long Island Sound, and one of the best in the world,

is three miles in extent, and has a depth of from four to seven fathoms; the river is navigable also for three miles above the city. The granite wharf, built by the New London Northern (Central Vermont) Railroad, is 1,125 feet long, 220 feet wide at the river end, and 150 feet at the shore end. On the east side is a United States navy-yard. As a whale-fishery port New London was from 1840 to 1857 second only to New Bedford. Since the decline of the whale fishery it has prosecuted the seal fishery (Alaska and New Shetland), and the cod and mackerel fisheries. A woolen-mill, a cotton-gin factory, iron foundries, a fruit-canning establishment, and an extensive cracker bakery are the chief manufacturing works in the city. The population was 10,115 in 1860, 9,575 in 1870, 10,537 in 1880, and 17,548 in 1900. In 1645 John Winthrop the younger settled on what was then known as Pequot Harbor, and in 1658 the Connecticut assembly resolved that the "plantation" should bear the name of New London. During the Revolution the harbor was the headquarters of the Connecticut privateering fleet. In 1771 the city was captured by Benedict Arnold, and, together with Groton, was burned by accident or design.

NEW MADRID, a town of the United States, and the county seat of New Madrid county, Mo., is located on the Mississippi river at the terminus of the Little River Valley and Arkansas railroad, forty-five miles southwest of Cairo, Ill. In 1811, the vicinity of the present town was visited by an earthquake which caused a large portion of the country to sink several feet below the surface. It was for a time overflowed by the Mississippi, and a large lake yet remains to testify to the violence of this seismic disturbance. The town contains a court-house, three churches, several schools, one newspaper office, one hotel, and nearly twenty stores, together with two saw-mills, one flour mill and one planing mill. Its population in 1900 was 1,489.

NEWMARKET, a market-town, partly in Cambridge and partly in Suffolk, and the seat of important horse races, is situated on the Cambridge and Bury branch of the Great Eastern Railway, thirteen miles northeast of Cambridge and sixty north by east of London.

NEW MEXICO, a Territory of the United States, is bounded on the north by Colorado, on the east by Texas and unorganized "public lands" adjacent to the Indian Territory, on the south by Texas and Mexico, and on the west by Arizona. It forms nearly a square, being about 335 miles in width from east to west and 345 miles in length from north to south on the eastern border, which lengthens to 390 miles on the west. As formed originally by the organic act of 1850, the Territory embraced Arizona and southern Colorado. In 1854 the "Gadsden Purchase" from Mexico added a strip along the southern boundary. In 1863 Arizona was detached and made into a separate Territory, and in 1865 the portion of New Mexico north of the thirty-seventh parallel was added to Colorado, leaving the Territory with its present boundaries, and an area of 122,460 square miles.

The whole area is elevated far above the ocean, the table-lands of the north being 6,000 to 6,500, those of the center 5,000, and those of the south about 4,000 feet above sea-level. The fall in the Rio Grande from the Colorado line to that of Mexico is about 3,500 feet. The whole except the eastern portion is traversed by mountains, passing from north to south, not continuously but in broken ranges, which, for convenience of description, may be divided into three parts. The main range of the Rocky Mountains enters the territory from the north, the highest peaks being the Costilla (12,615 feet), Taos, Mora (12,020), Truchas (13,150), and Baldy (12,661). This range disappears as a continuous chain



near Glorieta: Running east from this as a kind of spur along the Colorado line are the Raton Mountains, the pass in which, south of Trinidad, is 7,893 feet high. The railroad crosses this range through a tunnel. Commencing about twenty miles south of Santa Fé, and extending southward on the east side of the Rio Grande, is a broken range, known variously in localities from north to south as the Cerrillos, Placer, Sandia, Chilili, Manzana, Jumanes, Oscura, San Andres, and Organ Mountains—the last-named crossing into Mexico near El Paso. Near to the Rio Grande in Socorro county are the Fra Cristobal and Caballo Mountains. East of the above chain is a series of ranges, generally short, locally known as the Gallinas, Jicarilla, Carrizo, Capitan, Sierra Blanca, Sacramento, Hueco, and Guadalupe Mountains. On the west of the Rio Grande another broken range runs south, commencing at the singularly conspicuous San Antonio Mountain, close to the Colorado line, and known in its several parts as the Petaca, Valles, Nacimiento, Jemez, San Mateo, Ladrone, Oso, Madalena, Socorro, San Mateo (of Socorro), Black Range, Mimbres, and Florida Mountains, the latter extending into Mexico. Still farther to the west, and near the Arizona boundary, yet another series of comparatively short ranges is found, consisting of the Carrizo, Tunicha, and Chusca Mountains, which constitute part of the “great continental divide” separating the waters flowing into the Gulf of Mexico from those running into the Pacific, and more to the south the Zuñi, Datil, San Francisco, Escudilla, Tulerosa, Luera, Mogollon, Diablo, Pinos Altos, Burro, Sarampon, Hacha, Perro, Animas, and Peloncillo Mountains. These mountains are seamed with great “cañons,” which penetrate the larger “mesas” or tablelands in various places, where in some way the covering of lava which is their usual protection has been removed. Between contiguous ranges or spurs of the same range are frequently found “parks” of great beauty and fertility. These specially abound in the western part of Colfax county.

New Mexico, while generally requiring irrigation for its cultivation, is more fully provided with rivers than any of the other mining States or Territories. Its waters flow east to the Mississippi, south to the Gulf of Mexico, and west through the Colorado and Gila to the Gulf of California and the Pacific Ocean. The Rio Grande, called also the Rio Bravo del Norte, passes completely through the center of the Territory from north to south. It receives many tributaries, the principal being the Santa Fé and Galisteo from the east, and the Chama, Jemez, Puerco, and Alamosa from the west. Its valley is of great fertility, and capable of supporting a large population. The northeastern part of the Territory, including the greater part of the counties of Colfax, Mora, and San Miguel, is drained by the Canadian or Red River, which flows into the Arkansas. The branches of this stream are very numerous, the principal ones being the Cimarron, Mora, Concha, Pajarito, and Ute. The Pecos rises northeast of Santa Fé, and, flowing south, gives value to a vast belt of land, until it crosses the Texas line and finally joins the Rio Grande itself. Its valley is unsurpassed for fertility and agricultural worth. Among other streams, the Tecolote, Gallinas, Hondo, and Peñasco are tributaries to it. In the northwest is the Rio San Juan, from which that whole section is called the “San Juan country.” It flows west to the Great Colorado, and has as its principal branches in New Mexico the Animas from the north and the Chaco from the south. In the central west are the headwaters of the Little Colorado, and in the southwest those of the Gila, with the Mimbres, which flows south into Mexico.

In almost all parts of the Territory, except the pastoral plains, the precious metals are found, the mineral extending from the extreme north to the southern boundary. The eastern slope of the Rocky Mountains, in Colfax county, abounds in gold, and Elizabethtown, its chief village, was the scene of great mining prosperity a few years ago. The metal is found in “leads” as well as in extensive “placers.” On the opposite side of the range are both gold and silver, and a little farther south, near Picuris, are large deposits of copper. Traveling southward we find various minerals of value in the mountains east of Santa Fé; and the Cerrillos mining district, about twenty miles south of the capital, presents a rich deposit of silver not as yet fully developed. Here also are the famous turquoise mines, the largest in America, which played so important a part in the early history of the Territory. To the west in the Nacimiento region is a great body of copper. At the “Old Placers” and “New Placers,” in the southern extremity of the Santa Fé country, are located inexhaustible supplies of placer gold. The Manzana, Ladrone, and Madalena ranges, and, indeed, nearly all the mountains on both sides of the Rio Grande, contain rich mineral. Silver mines of great value are worked in the Socorro Mountains, directly west of the city of that name. The Black Range country is rich in silver and copper; and the more recent discoveries on the Percha river at Lake Valley promise to be of extraordinary richness and extent. The vicinity of White Oaks in Lincoln county is especially noted for its free gold, and the San Andres, Caballo, and Organ ranges abound in valuable ores. The greatest development has taken place in Grant county, whose “Santa Rita,” “Hanover,” and other copper mines are well known; the vicinity of Silver City and Georgetown produces great quantities of silver, while the newer districts in the southwest, in the vicinity of Shakespeare and Lordsburg, are also rich in the last-mentioned metal. To the north of Silver City are the Mogollon Mountains, where valuable mineral deposits are found. The mines, especially those of silver, were extensively worked by the Spaniards down to 1680.

Bituminous coal is found in inexhaustible quantities in very many sections of the Territory, notably near Raton in Colfax county, along the Galisteo river on the line of the Atlantic and Pacific Railroad, and near the Chama river in the northwest. Anthracite coal of an exceedingly fine quality exists in large amounts near Cerrillos station, being superior to many of the coals of Pennsylvania, and by far the best fuel thus far discovered west of the Mississippi river. Iron is found in many localities, but has not yet been worked, the more valuable metals monopolizing attention. Mica mines of large extent and excellent quality are at Petaca, Mora, near Nambé, and in other localities. Lead abounds in many sections carrying silver, and notably in the Cerrillos mines. Plumbago is found in Colfax county; and cement of a very superior quality is made at Springer. Gypsum, fire-clay, and mineral paints are among the mineral resources of the Territory; and marbles and other excellent building-stones abound.

Mineral springs of various kinds of great excellence are found in different localities. Prominent among them are the Las Vegas hot springs, the Ojo Caliente in Taos county, the Jemez hot springs, and the Hudson springs. These all have special medicinal qualities, and are of high temperature, the Ojo Caliente water being 114° and the Jemez 168°. There are also important springs south of El Rancho in Taos county and east of Santa Fé.

The climate is dry and the air clear throughout almost the entire year. The temperature at Santa Fé,

which is considered to have the best climate in the Territory, is sometimes as low in the winter as at New York, but the dryness of the atmosphere prevents the cold from being felt to anything like the same extent. The more southerly towns are, of course, warmer, not only on account of the difference in latitude, but also because of their decreased altitude. The rainy season occupies about a month, varying in time from the middle of July to the middle of September, but even then a wholly cloudy day is seldom seen, the mornings being bright, with showers in the afternoon. The comparative death-rate from pulmonary diseases in New Mexico is less than anywhere else in the United States, the proportions being—New England 25, Minnesota 14, Southern States 6, New Mexico 3. The average rainfall at Santa Fé for eight years (1874-81) was a little less than $14\frac{1}{2}$ inches, whereas the average at New York was 43, Boston 45, Philadelphia 44, Washington 37, St. Louis 42, and Savannah 48. The mean temperature was $48\frac{1}{2}^{\circ}$. The atmosphere is so clear and pure as to be proverbial. From the first characteristic arises the deception as to distances so generally experienced by strangers; and the second is evidenced by the fact that everywhere throughout the Territory the natives hang up their meat out-of-doors to dry, and use pieces of it as required, not the slightest taint arising from it during a series of months.

The greater portion of New Mexico is pastoral, being unfitted for agriculture from lack of water for irrigation. Wherever there is sufficient water either in streams or in springs to supply the wants of animals, the grass is amply sufficient to support either cattle or sheep. The Territory abounds in the most nutritious grasses, which retain their virtues during the winter; and the climate is such that shelter is not required other than that afforded by nature, in valleys and woods. The number of sheep is variously estimated from 7,000,000 to 10,000,000, and they are raised in every county. Within the past few years the breed has been much improved by the introduction of merino, Cotswold, and other fine-wooled varieties. The cattle business has reached enormous proportions within a few years, and is steadily advancing in importance. The immense profits received have induced the investment of large amounts of capital, and all the desirable ranches are being rapidly taken up and stocked. The business is changing in its character in two ways. Large corporations are taking the place of small owners, and, instead of ranging over the plains, the cattle are now generally confined to tracts exclusively owned or occupied, and fenced.

Agriculture is mainly limited to the valleys. Those of the Rio Grande, the Pecos, the Canadian, the San Juan, and their tributaries, though generally narrow, contain large areas of arable land of extraordinary fertility. They produce large crops of grain and of most kinds of vegetables, especially onions, beets, turnips, cabbages, cauliflowers, etc. Potatoes succeed best in the mountainous regions. The Taos valley is an exceptionally fine wheat country, and before the advent of railroads supplied a great part of the Territory with its flour. The Mora valley is also celebrated for its wheat. It is as a fruit-producing region, however, that a large portion of the irrigated land in the Territory specially excels. The Rio Grande valley from Embudo to Mesilla is particularly adapted to this purpose. The area of fruit and vine culture is being yearly extended. Peaches, plums, and apricots come to great perfection in the north, and pears, apples, quinces, cherries, etc., as well as the stone fruits, throughout the middle and southern sections. Grapes flourish from Bernalillo to El Paso, and in some favored spots like La Joya farther north. The grape principally cultivated is the "Mis-

sion," which produces excellent wine. Hardy American varieties like the Concord will do well anywhere, and the less hardy European varieties, such as the White Muscat, Flamed Tokay, etc., succeed admirably in the vicinity of Las Cruces. The Pecos valley also produces fruit of extraordinary size and beauty.

The supply of timber, especially of pine, is almost inexhaustible. It exists in nearly all the hilly and mountainous parts of the Territory, but is of very superior quality as regards both height and straightness in the vicinity of Tierra Amarilla. Cedar abounds in many localities, and the piñon makes an excellent fuel. Oak, maple, walnut, and ash are found to a more limited extent. The varieties of poplar commonly known as cottonwood and quaking aspen are the most common deciduous trees, and grow in almost all parts of the Territory. Several other native plants are proving of value. The *Yucca* of different varieties abounds—*Y. filamentosa*, commonly called amole or soapweed, covering immense tracts. Experiments have recently been made with a view to utilizing the fiber of the large serrated variety abundant in the south in the manufacture of rope, and the smaller kinds in paper-making, as well as using the root in preparing a substitute for soap. These bid fair to make this very abundant plant of large commercial value. The cañaire has long been known to possess powerful tanning properties, and recent experiments by the department of agriculture and elsewhere have demonstrated its value as a substitute for bark and other agents. The plant grows wild over a large extent of country, and its importance in a district producing so many hides and skins can hardly be overestimated.

The executive officers are a governor and a secretary. The higher judiciary consists of a chief justice and two associates, each of whom presides over the courts in one district, all three sitting together as an appellate supreme court in January of each year. The legislature consists of a council of twelve members and a house of representatives of twenty-four, elected by counties biennially. The governor possesses the veto power. The territorial officials are a treasurer, auditor, attorney-general and two district attorneys, and an adjutant-general. In each county there are a probate judge, sheriff, and other local officers, the chief authority being vested in a board of county commissioners of three members elected by the people. The counties are divided into precincts, in each of which there is a justice of the peace and a constable. At present there are twelve counties in the Territory. Public education is in charge of a board of three school commissioners in each county. A tax of one-fourth per cent. is levied for the support of public schools. Precincts may become independent school districts at their option.

The population of the Territory was 91,874 in 1870 and 119,565 in 1880. In 1900 census returns gave 195,310. The capital, Santa Fé, had 5,603 inhabitants.

The first European that traversed the Territory was Cabeza de Vaca (Nuñez), the treasurer of the unfortunate expedition of Panfilo Narvaez to Florida, who, being cast ashore on the coast of Texas, crossed the continent with three companions, and after encountering infinite difficulties and dangers arrived at Spanish settlements near the Gulf of California. On the way he passed through a land of "fixed habitations," which were evidently the Pueblo towns, followed the Rio Grande for many miles, and on his return to civilization gave such an account of his travels that great interest was excited. In consequence, Coronado, the governor of New Galicia, sent Marcos de Niza, a Franciscan monk, with Stephen, a negro who had been one of Vaca's companions, to reconnoiter the country. They penetrated as far as Zuñi, then called Cibola, where Stephen was

killed; but Marcos made up for the lack of substantial success by the marvelous nature of the report he presented. The next year, 1540, Coronado himself headed an expedition of 300 Spaniards and 800 Indians, and started from Culiacan on Easter Monday. He succeeded in finding Cibola, which he subjugated with the surrounding country, and then proceeded to the province of Tiguex (on the Puerco river). After this expedition several friars at various times entered the country, establishing missions, often at the cost of their lives. Among them one of the most prominent was Agustin Ruiz, who was killed in 1581. Almost immediately after this came the expedition of Espejo, who was sent by the viceroy to protect the missions. The next expedition of note was that of Oñate, toward the close of the century, which carried a large number of additional colonists into the Territory. From this time the Spanish population increased rapidly, and mining was extensively engaged in, the natives being reduced to a virtual condition of slavery in the mines. In 1680 the Indians, who had long been on the verge of rebellion, revolted, and under the lead of Popé, a chief of large influence, marched on Santa Fé, and there besieged Governor Otermín and the Spanish army, who were finally compelled to evacuate the town and retreat to El Paso. For thirteen years the Pueblos continued to control the country, defeating successive Spanish expeditions, until in 1693 Diego de Vargas, the new governor, succeeded in conquering them and a peace was made, one of the terms of which was that there should be no more slavery in the mines. In fact the Indians had filled up all the shafts in the meantime. For over a century afterward little occurred to disturb the tranquillity of the Territory, except occasional wars with the surrounding savage tribes. In 1804 Lieutenant Pike, exploring the headwaters of the Arkansas, by mistake camped on Mexican soil and was brought into Santa Fé and sent to Chihuahua as a prisoner. About this time the first goods were brought across the plains to the New Mexican market, being the commencement of the overland traffic of the Santa Fé "Trail," which increased yearly in importance until the railroads took the place of the "prairie schooner." In 1820 Mexico became independent, and New Mexico began to be governed by political chiefs instead of Spanish "Gobernadores."

By a change in the constitution in 1835, governors were appointed instead of elected, and Albino Perez was sent from Mexico as the new ruler. This excited much discontent, which was increased by the enactment of a new tax law two years later. About August 1, 1837, a revolutionary movement commenced in the north of the Territory among both Mexicans and Pueblos, having for its center the town of Cañada or Santa Cruz. Governor Perez marched to meet the insurgents, but was deserted by nearly all his troops and compelled to fly, and was soon after overtaken and killed near Agua Fria. A number of other prominent officials were also killed; and on August 10th Jose Gonzalez, a Taos Indian, was installed as governor in the palace. General Manuel Armijo, who had held high positions before, raised troops at Albuquerque to suppress the revolt, and finally defeated the rebels at Cañada. The Mexican Government confirmed his acts and appointed him governor, which office he held with some intermissions until the coming of an American army in 1846 under General Kearney, who marched from the Missouri and took possession of the Territory without bloodshed—General Armijo retiring southward. A provisional government was established by the Americans, and Charles Bent, an old resident, appointed governor, but he was killed in a revolt in January, 1847.

The treaty of Guadalupe Hidalgo made New Mexico a part of the United States, and by an act of Congress of September 9, 1850, it was organized as a Territory with a regular government. Early in 1862 a Confederate army from Texas invaded the country and occupied Santa Fé, March 10th; they were defeated, however, at Glorieta on March 28th, and evacuated the capital April 8th. The people of the Territory were commendably loyal, and supplied 6,000 men to the Union army.

The first rail was laid in New Mexico, November 30, 1878, by the Atchison, Topeka and Santa Fé Railroad, which reached Las Vegas July 1, 1879, Santa Fé February 9, 1880, and connected with the Southern Pacific at Deming March 18, 1881. This and the construction of the Denver and Rio Grande and the Atlantic and Pacific Railroads have given a great impetus to the Territory, which had (1900) 1,758 miles of track.

NEW MILLS, a township of Derbyshire, England, is situated at the confluence of the rivers Goyt and Kinder, on the borders of Cheshire, eight miles southeast of Stockport and seven southwest of Glossop. The name New Mills was given to it from a cornmill erected on the Kinder in the hamlet of Ollersett, and is now specially applied to the group of factories which have grown up around it. Formerly paper and cloth were the staple industries of the district, but now the inhabitants of the various hamlets are occupied chiefly in iron and brass foundries, cotton-mills, and print-works. The population in 1901 was about 8,000.

NEW ORKNEY. See NEW SOUTH SHETLAND.

NEW ORLEANS, a city of the United States, situated on the left bank of the Mississippi, 107 miles from its mouth, in that portion of the State of Louisiana which constitutes the river's larger delta. This peculiar region is an irregular expanse of densely wooded swamps, wide prairies, and sea marshes, embracing the whole coast of Louisiana on its southern border, and, narrowing rapidly northward, presents a total area of some 20,000 square miles of land and water.

The river at this point varies from 1,500 to 3,000 feet in width, and its broad channel often stretches almost from shore to shore, with a depth varying frequently at short intervals from 60 to more than 200 feet. The speed of the current reaches, in times of high water, a rate of five miles an hour. Along the immediate front of the city's principal commercial quarter, this current, losing some of its force by change of direction, deposits its alluvium in such quantities as to produce a constant encroachment of the shore upon the harbor. At its widest this new land, or batture, with wharves, streets, and warehouses following eagerly after it, has advanced nearly 1,500 feet beyond the water-line of a century and a half ago.

New Orleans is emphatically a commercial city. It is from its commercial value as the southern gateway of the immense valley behind it, and as the dispenser of the products of this greatest agricultural valley in the world that New Orleans has grown from a wild and indolent little frontier town of 10,000 inhabitants to the dimensions of a great city. Along its winding harbor front one sees, in the season that follows the harvests of the south and west, the energies and activities of an exporting movement not excelled in volume or value on the American continent save by New York. All other movement is subsidiary or insignificant, the import trade is small; manufactures are inconsiderable; mining interests are almost unknown, while there are comparatively no naval construction and but two notable government establishments—the mint and the custom-house. Educational and scientific institutions, conservatories of

art, galleries, monuments, and other evidences of the taste and refinement of the inhabitants are numerous.

On any hand it requires but a step or two aside from the current of commercial movement to carry one into the bowery repose of a city of villas and cottages, of umbrageous gardens, intersected by 470 miles of streets shaded by forest-trees, haunted by song birds, fragrant with a wealth of flowers that never fails a day in the year, and abundant, in season, with fruit—the fig, the plum, the pomegranate, the orange. No other large city in America is so laid open to the sunshine and the air. With the exception of Chicago no other American city covers so large a site as New Orleans, whose inhabitants, 287,104 in number, in 1900, have spread out their town over an area of 155 square miles.

New Orleans is exceptionally interesting among cities of the United States for the picturesqueness of its older sections, and the language, tastes, and customs of a large portion of its people. It was founded in 1718 by Jean Baptiste Lemoyne de Bienville, a French Canadian, governor of the French colony which, nineteen years earlier, had been planted by his brother D'Iberville on the neighboring shores of the Gulf, along the eastern margin of the Bay of Biloxi. A few years after its founding, and while it was still but little more than a squalid village of deported galley slaves, trappers, and gold hunters, it was made the capital of that vast Louisiana which loosely comprised the whole Mississippi valley to Canada on the north and without boundary on the west, under the commercial domain and monopoly of John Law's scheme, so famed in history under the merited nickname of the Mississippi Bubble.

After being subjected to French and Spanish domination for nearly one hundred years, the city, with a population of 10,000 souls, passed from the hands of the French colonial prefect to those of the commissioners of the United States. At the time, the prospect of its future commercial greatness was not only appreciated but was exaggerated even by the most sagacious minds; for they regarded it in the light of its remarkable geographical position, and of those stirrings of revolution which were beginning to promise the birth of other republics round about the broad circuit of the Mexican Gulf, with maritime powers and commercial energies that must give the position of New Orleans an inestimable value.

New Orleans held its highest place on the comparative scale of cities in the United States when, by the census of 1840, only New York, Philadelphia, and Baltimore were greater in population. In the decades that followed, these cities left it far behind and others overtook it and passed it by. The development of the carrying trade on the lakes of the far north, the adoption by the world's maritime trade of ships and steamers drawing too much water to pass the bars at the mouth of the Mississippi, and in the city the riot made by death, which in three years (1853-55) from a population diminished by flight to barely 145,000, carried off over 35,000 persons—these things and others combined to impede the town's progress at a time when the growth of American cities was a marvel of the times, and to reduce her comparative importance in population, wealth, enlightenment, and architectural dignity.

Turning from these comparisons, and contrasting the city only with itself, the trading post of 1721 had been changed in 1860 to a metropolis, the imports, exports and domestic receipts of which aggregated \$334,000,000. In the latter year, the election of a president from the Republican party was followed by the war between the States, paralyzing the commerce and trade of the city, and producing an effect from which New Orleans has been more than a quarter of a century in recovering.

Only in the last years did its total commerce distinctly reach the magnitude it enjoyed in the year 1860, and the drawbacks enumerated so expend their power, that New Orleans now looks out upon a future of more genuine promise than ever before. A system of JETTIES (*q.v.*), at the mouth of the Mississippi, built by the distinguished engineer Eads in 1879, has opened the city's deep and spacious harbor to the largest ocean craft. Lines of steamers to the great ports of Europe are replacing with their great carrying capacity the light tonnage of other days. An active sanitary system, which grows every year better, gives reasonable promise of immunity from the deadly epidemics of former years; street paving has recommenced; the inadequate and superficial drainage is being improved, under the direction of a sanitary association auxiliary to the board of health, a diligent house-to-house inspection is being performed, and the open gutters that are in all the streets are daily flushed during the warm months with water thrown into them by powerful pumps at the river front. The annual mortality rate now averages 26.52 per 1,000. The old spirit of dependence upon natural advantages which once deluded the people of the city is yielding to a more energetic acceptance of the principles of modern commerce, and railway connections, near and remote, are increasing year by year. The immense increase of population and products in that wide southwest that stretches out beyond to the Mexican border offers new accessions of commercial tribute. Mexico holds out fair assurance of a new era of political order and material development; and within the city's immediate bounds both the convictions of her citizens and the movement of capital are recognizing theoretically and practically the necessity and advantage of manufactures. About \$10,000,000 are at present invested in this direction, and the aggregate is steadily growing.

Within the last seven years a new impulse toward architectural improvement has shown itself, and several edifices of comparatively imposing character have been erected. Chief among these are the Cotton Exchange, Louisiana National Bank, the Jewish Widows' and Orphans' Home, etc.

The municipal control of the city is vested in a mayor, comptroller, treasurer, commissioners of public works and buildings, city attorney, city surveyor, and a board of aldermen consisting of thirty members. During the year 1889, the receipts of the city from all sources amounted to \$1,264,319.03 and the expenditures to \$1,189,375.47, the latter including \$155,000 paid for the maintenance of the police department, a similar amount for that of the public schools and \$223,500 for the support of the fire department.

On January 1, 1890, the municipal debt aggregated \$17,009,209.82, made up of a floating debt amounting to \$548,949.93, a bonded debt of \$16,395,861.11, and miscellaneous debts footing up \$64,398.78. The real and personal property of the city at the same date was listed at \$122,000,000 and the rate of taxation fixed at 20 mills per \$100.

During the past ten years the educational system of New Orleans has made marked progress. It is a large and excellent one, deserving of much praise and affording to the youth of the city, both white and colored, excellent facilities for the acquisition of learning through the primary, intermediate, and high school grades. Supplementary to these are the Tulane University, containing, in addition to medical, law, and academic departments, an industrial school, the Sophia Newcomb College for girls, a branch of Tulane College, four colleges established by the colored people and patronized by both sexes, the College of the Immaculate Concep-

tion, Locquat Institute, and many other private institutions. Among the libraries are the Howard Memorial, the Louisiana State and the Fisk or Tulane Library, containing a total of 170,000 volumes.

Churches, both Catholic and Protestant, are numerous and largely attended. Many of them present an imposing appearance, notable among which are the French Cathedral opposite Jackson Square, Christ Episcopal Church on St. Charles street, the Church of the Immaculate Conception, St. Patrick's, and some others.

The first settlers of New Orleans were such men as colonies in America were generally made of when planted by royal commercial enterprise, and such wives as could be gathered hap-hazard from the ranks of Indian allies, African slave cargoes, and the inmates of French houses of correction. As time passed, gentler and often better blood was infused by the advent of the *filles à la cassette*, by victims of *lettres-de-cachet*, by the cadets of noble families, holding land grants or military commissions, by Spanish officials glad to strengthen their influence in the colony through matrimonial alliances, and by royalists fleeing the terrors of the French Revolution. The influences of the climate and landscape were such as to emphasize rather than counteract the effects of these conditions; and, when in the year 1809 Napoleon's wars caused an exodus of West Indian creoles into New Orleans that immediately doubled the town's population, the place naturally and easily became the one stronghold of Latin-American ideas in the United States, a harbor of contrabandists, Guadeloupean pirates, and Spanish-American revolutionists and filibusters. Under the glacier-like pressure of Anglo-American immigration, capital, enterprise, and education, this creole civilization has slowly and with stubborn reluctance yielded ground, and is at length fairly beginning to amalgamate with the better social system of the American nation.

The colored population, notwithstanding the presence among it of that noted free quadroon class which has enjoyed a certain legal freedom for many generations, has not greatly improved since the date of emancipation. A conventional system of caste cuts them off from the stimulating hope of attaining social rank, and confines them closely to servile employments. The probability seems to be that their decided elevation must wait upon their acquisition of material wealth, an achievement which the conditions mentioned and some inherent deficiencies of the race tend to make extremely difficult. Besides the large Anglo-American and creole populations, there are in New Orleans weighty fractions of Irish and Germans and an appreciable number of Italians, Sicilians, and Spaniards. Another noted feature of New Orleans is its cemeteries. Owing to the undrained condition of the subsoil, burials are made entirely above ground, in tombs of stuccoed brick and of granite and marble. Some of these are very elegant and costly, and many of the burial-grounds, with their long alleys of these tombs of diverse designs deeply shaded by avenues of cedars and the *Magnolia grandiflora*, possess a severe but emphatic beauty.

The climate is not marked by extremes of heat or cold. The wide reaches of water and wet lands that lie about the city on every side temper all airs, and the thermometer rarely passes above 95° or below 27° Fahr. The consequent humidity of the atmosphere, however, gives the climate an enervating quality and an apparent warmth and cold beyond the actual temperature. It is rarely invigorating, and during the long summer between June and October is distinctly though not severely debilitating; but in the absence of epidemic yellow fever, whose visitations are becoming more and more infrequent, there is no "sickly season;" and those

who visit the city between the months of November and June, the term in which the commercial movement is at its height, may enjoy from its beginning to its end the delights and beauties of a redundant springtime. The United States census of 1900 gave New Orleans a population of 287,104.

NEW PHILADELPHIA, an Ohio town, the capital of Tuscarawas county, lies on the Tuscarawas river. It has railroads, telegraphs, banks, churches, schools, etc. It has some manufactures, and a trade in coal and iron. Population, 1900, 6,213.

NEW PLYMOUTH, a seaport on the west coast of the North Island of New Zealand, is situated about twenty miles to the northeastward of Cape Egmont. It is the capital of the provincial district of Taranaki.

NEWPORT, a municipal and parliamentary borough of Hampshire, England, and the county town of the Isle of Wight, is situated near the center of the island, at the head of the navigation of the Medina river, about seven miles from the sea at Cowes.

NEWPORT, a seaport, market-town, and municipal and parliamentary borough of Monmouthshire, is situated on the right bank of the Usk, about four miles from its confluence with the Bristol Channel, and twelve miles northeast from Cardiff. On the east, north, and west it is finely sheltered by a line of lofty hills, and the neighboring scenery is picturesque; but the town is chiefly composed of a mean class of houses, although there are many good villas in the suburbs. The old parish church of St. Woollos is one of the most curious churches in England. The old castle, built about 1130 by Robert earl of Gloucester, was a very extensive structure in the Late Perpendicular. Newport owes its rapid increase to its situation on a deep and spacious tidal river, which renders it a convenient outlet for the trade of a very rich mineral district. It is now supplied with very extensive docks and wharves, to which steamers of the largest size can have access at all tides.

The population of the parliamentary borough (area 2,690 acres) in 1901 was 67,290.

NEWPORT, a city of the United States, capital of Campbell county, Ky., lies on the south bank of the Ohio river, opposite Cincinnati, and separated from Covington by the Licking river. With the larger city it is connected by a road-and-railway pier bridge, and with the lesser by a suspension bridge partly used by a street railway. Practically both Newport and Covington are residential suburbs of Cincinnati, but in the matter of population (28,301 in 1900) Newport ranks third among the cities in the State. The local manufactures comprise rolling-mills, steel-works, iron foundries, watch-case factories, and stove factories. For many years a small garrison of United States soldiers has been stationed here. The first settlement dates from 1791.

NEWPORT, a city of the United States, one of the capitals of the State of Rhode Island, and among the most fashionable of American watering-places, is situated on the west coast of the island from which the State derives its name, on the isthmus of the southern peninsula. By rail it is 19 miles south-southwest of Fall River, and by steamer 162 miles from New York. In front lies an excellent harbor opening into Narragansett Bay, with a fine anchorage in thirty feet of water between Fort Adams (a military post of great importance) and Goat Island (headquarters of the torpedo division of the United States navy), and allowing vessels of eighteen feet draught to reach the piers at low water. But it is rather the attractions of the east and south coast that have made the fortunes of the modern city—First or Easton's Beach, one of the safest for sunbathing; Second or Sachuest Beach, exposed to heavier

breakers; Third Beach, more secluded than either; the Hanging Rocks, where Berkeley is said to have composed his *Minute Philosopher*; Lily Pond Beach; and the Spouting Cave, where the water dashes through a hole in the roof to a height at times of fifty feet. These and other points of interest are connected with the city by avenues and drives, many of which are lined in whole or in part with villas and cottages; and in fact Newport as a watering-place may be said to comprise the whole of the southern peninsula. In its narrower limits as a city it is a place of no small interest. In Washington Square, the central point of the old town, stand the State-house (dating from 1742), the city hall (1763), and the opera-house (1867). Trinity Church has an organ presented by Bishop (then Dean) Berkeley, and the first Baptist church dates from 1638. The synagogue, founded in 1762, is the oldest in the United States; it is still used, though there are few Jews in Newport, endowments for keeping it in repair and maintaining services having been left by the brothers Abraham and Judah Touro, the latter of whom also gave the city \$10,000 toward the purchase of Touro Park. The Jewish cemetery is the subject of one of Longfellow's best pieces. Redwood Library, established in 1747, has 37,000 volumes; and there is a free people's library with 25,000. Besides the bronze statue of Com. M. C. Perry, of Japanese fame, Touro Park contains an old tower, supported on round arches, which has been one of the greatest antiquarian puzzles in the United States—some considering it a monument of the Norsemen who visited America before Columbus, and others maintaining that it is only an old windmill dating from the seventeenth century. At one time, previous to the War of Independence, Newport was the seat of great commercial activity, but it now holds a very secondary position in both trade and manufacturing industry. The urban manufactures of the county were in 1900 290 in number, with an aggregate capital of \$2,500,000, the annual yield of products being \$3,500,000. The population of the city was 15,693 in 1880, and 22,034 in 1900.

NEW PROVIDENCE. See **BAHAMAS**.

NEW ROCHELLE, a town of New York, in Westchester county, lies on Long Island Sound. It is a railroad and telegraph station, and has banks, churches, schools, etc. It has also some manufactories, among them being one of druggists' scales. Population (1900), 14,720.

NEW ROSS, a market-town and parliamentary borough of Leinster, Ireland, partly in Wexford and partly in Kilkenny, is situated on the acclivity of a hill on the east bank of the Barrow, two miles below its junction with the Nore, eighty-five miles south-southwest of Dublin and twenty-four west-northwest of Wexford.

NEWRY, a seaport, market-town, and parliamentary borough, partly in Armagh, but chiefly in Down, province of Ulster, Ireland, is situated on the Newry navigation at the head of Carlingford Lough, and on two railway lines, eighteen miles southeast of Armagh and sixty-three north of Dublin. The western part, called Ballybot, is connected with the eastern part or old town in Down, situated on the acclivity of a hill, by four stone bridges and a swivel bridge.

NEW SHOREHAM. See **SHOREHAM**.

NEW SOUTH SHETLAND, or simply **SOUTH SHETLAND**, a group of islands on the borders of the Antarctic polar regions, lying about 600 miles south-southeast of Cape Horn, and separated by Bransfield Strait from the region composed of Palmer Land, Trinity Land, Louis Philippe Land, etc. The more considerable islands are those of Smith (or James), Jame-

son (or Low), Snow, Livingston, Deception, Greenwich, Nelson, King George, Elephant, and Clarence. Deception Island is particularly remarkable as of purely volcanic origin. On the southeast side an opening 600 feet wide gives entrance to an internal crater-lake (Port Foster), nearly circular, with a diameter of about five miles and a depth of ninety-seven fathoms. Steam still issues from numerous vents, and hot springs bubble up from beneath the snow-clad surface. Most of the islands are rocky and mountainous, and some of their peaks are between 6,000 and 7,000 feet in height. Covered with snow for the greater part of the year, and growing nothing but lichens, mosses, and some scanty grass, the South Shetlands are of interest almost solely as a great haunt of seals, which share possession with albatrosses, penguins, and other sea-fowl.

NEW SOUTH WALES. The whole of the eastern part of Australia, including the several colonies of New South Wales, Victoria and Queensland, received the name of New South Wales from its first explorer, Capt. James Cook, in 1770. The present colony of New South Wales originated in a penal settlement formed by the British Government, when Capt. Arthur Phillip, R. N., its first governor, arrived at Botany Bay, in H. M. S. *Sirius*, in January, 1788, with six transports and three storeships, where they anchored, but subsequently proceeded to Port Jackson, which was found to be more suitable than Botany Bay for the new settlement; he there landed 750 "persons" under his charge, and the British ensign was for the first time hoisted on the shores of Sydney Cove, now the capital and seat of government.

The colony is situated between 28° 10' and 37° 28' S. latitude and 141° and 153° 37' E. longitude, and comprises an area of 310,700 square miles, *i.e.*, more than six times the area of England, and nearly three times the size of Great Britain and Ireland, with a population, June 30, 1901, of 1,366,408. The early history of the colony was not free from trouble. The first governor, Captain Phillip, remained from January 26, 1788, to December 10, 1792, and was succeeded by Captain Grose, December 11, 1792, to December 12, 1794; Captain Paterson, December 13, 1794, to September 1, 1795, when a duly appointed governor, Captain Hunter, R. N., arrived and remained from September 7, 1795, to September 27, 1800. Capt. P. G. King followed, September 28, 1800, to August 12, 1806, when he was followed by the unfortunate Captain Bligh, whose rule came to an abrupt termination by a general revolt; and after an interregnum of nearly two years, Maj.-Gen. L. Macquarie arrived, and January 1, 1810, assumed the governorship, which he retained for nearly eleven years, since which time there has been a regular succession. "Botany Bay" was for many years almost synonymous with Australia, and had a most unsavory reputation; but with the cessation of the long European war after Waterloo, and the great distress in England consequent upon the return of so many men discharged from the army and navy, attention was attracted to Australia as a center of emigration. In 1813 the interior of the country was explored, and the great plains being found admirably adapted for sheep-farming, several breeds of sheep, including the celebrated merino, were introduced, and a foundation laid for the future prosperity of the country. The agricultural progress of the country has been truly marvelous. In the year 1792 there were but 23 head of cattle, 11 horses, 105 sheep and 43 pigs. On December 31, 1900, there were 481,417 horses, 1,983,116 cattle, 39,811,991 sheep, and 256,577 pigs. In 1900 no fewer than 221,265,084 pounds of wool, valued at \$41,713,060, were exported.

Minerals at first attracted but little attention, but in

these the country is also rich; the gold-fields were discovered in 1851, and up to the end of 1888 these had produced \$185,000,000; coals, during the same period, \$105,000,000. Copper, silver, tin, iron, antimony, asbestos, cinnabar, and kerosene shale are also found; and, in small quantities, diamonds, rubies, opals, and other precious stones. The total annual value of the minerals is about \$19,000,000.

Agriculture is of course the great industry of the colony. About 2,343,138 acres are under cultivation, producing during the year ending March 31, 1901, 23,060,064 bushels of wheat and other kinds of grain, with 63,253 tons of potatoes, and 1,905 hundredweight of tobacco. Sugar cane to the extent of 199,118 tons was produced, also 891,190 gallons of wine, 11,170 gallons of brandy, and 540,523 cases of oranges. So rich is the soil and so genial the climate that almost every kind of fruit and vegetables may be grown. The total extent of land leased for pastoral occupation and homestead purposes in 1899 was 128,034,958 acres. At Sydney the range of thermometer averages 62.9, about the same as at Madrid; at Bathurst the mean temperature is 58.1, and on the inland plains about 70. The country is well watered, the chief rivers being the Darling and the Lachlan, both tributaries of the Murray, which divides the colony from Victoria. In 1851 the south of the country was formed into the separate colony of Victoria, and in 1859 the northern portion into that of Queensland.

All religions are free, there is no establishment, and all payments are voluntary, with the exception of such as remain due under former arrangements. About two-thirds of the people are Protestants, the greater part members of the Church of England; there are 299,990 Roman Catholics. The See of Sydney, now Metropolitan, was erected in 1836, when it comprised the whole of Australia, but in 1847 took its present designation; the other sees in New South Wales are those of Newcastle, 1847; Goulburn, 1863; Bathurst, 1869; Grafton and Armidale, 1868, and Riverina, 1885; the clergy number about 347. The head of the Roman Catholic Church is His Eminence the Cardinal Archbishop of Sydney, with bishops of Maitland, Bathurst, Armidale, and Goulburn. Presbyterians and Methodists come next, but almost every sect is represented. Education is compulsory; more than one-fourth of the entire population (238,382) were enrolled in 1900, the gross expenses of the Public Instruction Act and other educational payments amounted to \$3,488,610. The university of Sydney, incorporated in 1851, enjoys a deservedly high reputation; degrees granted there rank with those of Oxford and Cambridge. Of churches and chapels the total number belonging to all denominations was 1,896; but, as Defoe said of England nearly two centuries ago,

"Wherever God erects a house of prayer,
The Devil always builds a chapel there,"

the number of public houses being 3,270, or very nearly two to every church.

"Assisted" emigration from the mother country is for the present suspended. Under the scheme formerly in operation, emigrants were selected by the agent-general in London, but intending emigrants now have to pay for themselves, the ordinary passage money by first-class steamers being: cabin, \$250; intermediate, \$180; or steerage from \$80. Female servants, especially such as could take part in farming and dairy operations, were much in demand. The estimated population was 1,366,408, made up of males, 717,041, and females, 649,367, showing a preponderance of males of no less than 67.674.

The estimated number of aborigines in the colony is, full-blood, 5,689; half-castes. 2,402: total, 8,091.

"Responsible government" was established by the Constitution Act, 18 and 19 Vict., c. 54, and is invested in a governor, appointed by the crown, and a legislative council consisting of 70 members. The legislative assembly consists of 137 members, representing 73 electoral districts; with few exceptions all native-born or naturalized males, twenty-one years of age, who have resided in the district six months, are entitled to the franchise. The voting is by ballot.

Railways, roads, and bridges have their several departments. There were open, June 30, 1900, 2,811 miles of railway, and 55 miles in course of construction; and, at the same date, there were 41,494 miles of telegraph wire, with 460 stations. The post-offices numbered 1,668, the number of letters conveyed was 78,129,000; of newspapers, 51,000,000; and of packets, 13,846,737. There are now 51 miles of tramways open for traffic.

The trade of the country is very large; in 1901 the number of vessels which entered and cleared was 7,032, with a total tonnage of 8,014,000; the value of exports being \$140,822,580; and of imports, \$137,805,375; together, \$278,627,955. The colony possesses seventeen banks, with a paid up capital of \$65,000,000, and total assets, \$220,000,000. Of savings banks there were 351, with deposits amounting to \$20,000,000. The public debt is heavy; on June 30, 1900, it amounted to \$326,664,965, but it was mostly incurred for the construction of railways, telegraphs, and other reproductive public works.

While fully trusting to the ability and willingness of the mother country, the colony has not been altogether unmindful of defense. On December 31, 1900, there were enrolled in the naval and military service of the colony 12,849 men; 1,068 artillerymen, 96 engineers, 103 submarine miners, 3,004 infantry, 167 mounted infantry, and a reserve force of 2,709, consisting of cavalry, artillery, infantry, and rifle corps. The naval brigade and naval artillery volunteers comprise about 614 officers and men. The officers and men who formed the well-known "Soudan contingent" were selected from these forces.

Sydney, the chief city and capital (12,043 miles from London via the Suez canal), stands on the shore of Port Jackson, surrounded by scenery of surpassing beauty. It extends four miles north and south by three miles east and west, and contains 373 miles of streets with about 39,000 houses, or, including suburbs, a population (1901) of 451,000. About 800 acres have wisely been set aside for parks and open spaces; here are situated the government buildings, royal mint, the university, free public library, observatory, two cathedrals, and numerous churches and chapels. The other large towns with their populations (census, 1901) are Newcastle, 16,170; Bathurst, 9,490; Goulburn, 10,680; Paramatta, 12,500; Maitland E. and W., 10,800; and Grafton, 3,905.

Total revenue in 1900.....	\$50,000,000
Raised by loans.....	11,900,000
Total expenditure.....	49,045,000
Public debt, Dec. 31st, 1900.....	326,665,000
Value of total imports, 1900.....	137,805,000
Imports for United Kingdom.....	46,000,000
Value of total exports, 1900.....	140,825,000
Exports to United Kingdom.....	41,000,000

The flora of New South Wales, which comprises about 3,000 species of plants, exclusive of mosses, lichens, fungi, and seaweeds, is characterized by many peculiar forms.

As New South Wales has no natural boundary except the Pacific, there are no organic types which characterize this colony in the same degree as the marsupials, proteads, eucalypts, and acacias distinguish the Australian region as a whole. In this respect

neither do its northern districts differ from South Queensland nor its southern from northeast Victoria, while its west is uniform with the rest of the great continental plain. With this proviso, New South Wales may be justly regarded as the typical region of East Australia. It is made up of three strips, each a sub-region in itself—the coast, the dividing range and its plateaus, and the lower western plains. The coast ranges, bathed by a heated oceanic current, shelter a warm and moist sea margin, in which as far as 34° 40' S. latitude we find jungles of palms, figs, nettle-trees, and a host of other sub-tropical plants, haunted by talegallas, fruit pigeons, flying foxes, etc.; the tablelands enjoy an essentially temperate climate; and in the plains of the interior the scanty rainfall imposes further restrictions on animal and vegetable life.

The indigenous mammals are all marsupial, with the exception of a few bats and rodents, and even among these *Hydromys* is peculiar. This indicates permanent isolation since Mesozoic time. The dingo was doubtless introduced by man, while whales and seals belong to no coast in particular. The dugong (*Halicore*) is not found south of Moreton Bay. Many extinct marsupials, belonging to Australian types, but of gigantic size, as *Diprotodon*, *Nototherium*, *Thylacoleo*, with huge kangaroos, are found in Pleistocene deposits. With them are associated *Thylacinus* and *Sarcophilus*, now restricted to Tasmania. No *Didelphys* occurs, fossil or recent.

Up to the present time but little enterprise has been displayed in developing the extensive sea-fisheries of the colony.

The early history of New South Wales was for many years that of Australasia, and it has little more interest than what pertains to the philosophy of penal settlements. It was a distant prison maintained at the imperial cost. The commercial epoch began when Captain Macarthur found that the climate was suited to the growth of fine wool. The first sheep came from the Cape, mixed with a few from India. He got together a flock of 1,000, and noticed that even in his mongrel flock careful culling and breeding led to a great improvement in the wool, and this set him on considering the importance of having good rams. The fortunate arrival in the colony from the Cape of some fine-wooled sheep of the Escorial breed gave him the opportunity of adding three rams and five ewes to his flock, which he subsequently further improved on a visit to England, by purchasing some of King George III.'s stock at Kew. The stud flock he thus formed, and which was kept at Camden for fifty years, laid the basis of an expansive industry. From that time the colony had an export. The growth of live stock quickly overtook the demands of the local population for meat, and then another colonist, Mr. O'Brien, made the discovery that if sheep were worth nothing for meat they were worth something for tallow, and boiling down became the destiny of all the surplus stock. This waste of meat was suddenly stopped when the next great epoch in the history of the colony was opened up by the discovery of gold. Victoria soon outstripped the mother-colony by its superior attractions in this respect, but New South Wales gained the enormous advantage of having its pastoral industry stimulated and made more profitable. The unoccupied country became worth taking up, till every portion of the territory that was at all occupiable was leased. The political government was at first necessarily a strictly military one, but as the number of freed men and their children increased, and the number of free settlers increased also, the demand for some form of representative government arose, and became irresistible. A legislative council was established, partly

nominate and partly elective. Coincidentally with this grew up a demand that transportation should cease, and the agitation on this question has been the only serious conflict between the colony and the mother-country. It was ended by the mother-country yielding, and transportation was somewhat reluctantly abolished in 1853. At about the same time the mixed legislative council was superseded by the existing parliamentary system of two houses and responsible government, under which the colony has prospered contentedly ever since.

NEWSPAPERS. The authenticated history of newspapers begins in Germany. The earliest plainly *periodical* collection of the "news of the day," as distinguished from the isolated news-pamphlets, is the *Frankfurter Journal*, a weekly publication started by Egenolph Emmel in 1615. Antwerp follows with its *Nieuwe Tijdinghen* of 1616. Six years later came the establishment in London, by Nathaniel Butter and his partners, of a like paper, under the title of *The Weekly News*. All these were the enterprises of "stationers," under taken in the ordinary way of their trade, and hawked about the streets by itinerating "mercuries." The foundation in Paris, in 1631, of a journal that eventually attained fame as the *Gazette de France*, and which still exists, had a very different origin and different aims. The history of the "leading article" as a great factor in the shaping of public opinion begins with Swift, Defoe, Bolingbroke, and Pulteney, in the many newspapers, from *The Review* and *The Examiner* to *The Craftsman*, by which was waged the keen political strife of the years 1704-40. There is no counterpart to it in France until the Revolution of 1789, nor in Germany until 1796 or 1798. When the *Mercure de France*, after a long period of mediocrity, came into the hands of men of large intellectual faculty, they had the most cogent reasons for exerting their powers upon topics of literature rather than upon themes of politics. True political journalism dates only from the Revolution. It occupied a cluster of writers, some of whom have left an enduring mark upon French literature. A term of high aspiration was followed quickly by a much longer term of frantic license and of literary infamy. Germany has to some extent its parallelisms; but German journalism, if it never soared so high, never sank so low. Journalism in Germany has made steady advances onward; and in one grand feature—that of far-gathered information from foreign countries, not merely of incidents, but the growth of opinion and the state of social life—the leading newspapers of Germany keep much ahead of their best French contemporaries.

In all the other countries of Europe political journalism, in any characteristic sense, is a thing of the present century. The *Ordinarie Post-Tidende* of Stockholm dates from 1643, but until very recent times it was a mere news-letter. Denmark had no sort of journal worth remark until the foundation, in 1749, of the *Berlingske Tidende*, and that, too, attained to no political rank. The *Gazette* of St. Petersburg, which dates from December 16, 1702, is a government organ, and nearly synchronizes with the first successful newspaper in the British colonies in America. Journalism in Italy begins with the *Diario di Roma* in 1716, but in politics the press remained a nullity until nearly the middle of the present century, when the newspapers of Sardinia, at the impulse of Cavour, began to foreshadow the approach of the influential Italian press of the present day. In Spain no rudiments of a newspaper press can be found until the last century. As late as in 1826 an inquisitive American traveler records his inability to lay his hands, during his Peninsular tour, upon more than two Spanish newspapers.

The development of the modern newspaper is due to a union of causes that may well be termed marvelous. A machine that from a web of paper three or four miles long can, in one hour, print, fold, cut, and deliver 24,000 or 25,000 perfected broadsheets is after all not so great a marvel as is the organizing skill which centralizes in one office telegraphic communications from every important town in Europe, Asia, America, and Australia, and which then distributes those communications—directly or indirectly—to thousands of recipients simultaneously, by day and by night, throughout the land. Julius Reuter's enterprise grew immediately out of the thoughts of an observant Prussian government-messenger on the extraordinary excitement which he witnessed during the revolutionary movements of 1848. In 1849 he established a news-transmitting agency in Paris. Between Brussels and Aix-la-Chapelle he formed a pigeon-service, connecting it with Paris and with Berlin by telegraph. As the wires extended, he quickly followed them with agency-offices in many parts of the Continent. When he came to London, his progress was for a moment held in check. The editor of *The Times* ended their interview by saying, "We generally find that we can do our own business better than anybody else can." He went to the office of *The Morning Advertiser*, and had better success. He entered into an agreement with that and afterward with other London journals, including *The Times*, and also with many commercial corporations and firms. The newspapers found great advantage in the use of Reuter's telegrams as supplementary. His enterprise grew apace. In 1865 it was transferred to a limited company. In 1868 the London Press Association was formed. It contracted with Reuter's company to supply their telegrams exclusively throughout the United Kingdom, London only excepted. In connection with the intelligence department of the postoffice, the Association supplies parliamentary, judicial, and market news. The enterprise was organized by Mr. John Lovell, now editor of *The Liverpool Mercury*. London has now at least nine other press and telegraphic associations; Paris probably has almost as many.

The first English journalists were the writers of "news-letters," originally the dependents of great men, each employed in keeping his own master or patron well informed, during his absence from court, of all that transpired there. The duty grew at length into a calling. The writer had his periodical subscription list, and, instead of writing a single letter, wrote as many letters as he had customers. Of the earlier news-letters good examples may be seen in Sir John Fenn's collection of *Paston Letters*, and in Arthur Collins' *Letters and Memorials of State*. Of those of later date, specimens will be found in Knowler's *Letters and Despatches of Strafford*, and such as have a very high historical interest may be seen in abundance among the papers collected by the historian Thomas Carte, now preserved in the Bodleian Library at Oxford. Although no genuine newspaper of the sixteenth century can be produced, English pamphlets, as well as French, Italian, and German, occur with such titles as *News from Spaine*, and the like. In the early years of the seventeenth century they became very numerous. The most eminent purveyors of reading of this sort were Nathaniel Butter, Nicholas Bourne, and Thomas Archer; and by them was issued, in May, 1622, the first authentic English periodical newspaper now known to exist. It is entitled "The 23d of May—*The Weekly News from Italy, Germany, &c.*, London, printed by J. D. for Nicholas Bourne and Thomas Archer." Nathaniel Butter's name does not occur on this number, but on

many subsequent numbers it appears in connection sometimes with Bourne's and sometimes with Archer's name, so that there was probably an eventual partnership in the new undertaking. November, 1641, is especially noticeable for the publication, in the form of a newspaper, of the earliest authentic report of the proceedings of parliament. It was a weekly periodical, and sometimes contained ordinary news in addition to its staple matter. This was followed, within five years, by a long train of newspapers, most of which were published weekly. Those which stand out most saliently from the rest are the *Mercurius Britannicus*, *M. Pragmaticus*, and *M. Politicus*, of Marchmont, Needham, and the *Mercurius Aulicus* of John Birkenhead.

Birkenhead's *M. Aulicus* was also begun in 1643, and continued, although irregularly, until nearly the close of the civil war. Under Cromwell, the chief papers were *M. Politicus* and *The Public Intelligencer*. These publications were issued on different days of the week, and at length they became conjointly the foundation of the present *London Gazette*. After the Restoration, an office of surveyor of the press was instituted, to which Roger L'Estrange was appointed. He continued the papers above mentioned, but changed their titles to *The Intelligencer* and *The News*.

Joseph Williamson was for a time L'Estrange's assistant in the compilation of *The Intelligencer*, from which he soon withdrew, and organized for himself a far-spread foreign correspondence, and carried on the business of a news-letter writer on a larger scale than had till then been known. The first number of *The Oxford Gazette* was published on November 14, 1665. With the publication of the twenty-fourth number it became *The London Gazette*. Williamson had the general control of it. For a considerable time Charles Perrot, a member of Oriel College, was the acting editor. From such humble beginnings has arisen the great repository of State Papers, now so valuable to the writers and to the students of English history. It has appeared twice a week, in a continued series, for nearly two hundred and twenty years. The editorship, a government appointment, is now commonly given in reward of distinguished service upon the ordinary newspaper press.

In November, 1675, L'Estrange—not yet tired of journalism—commenced *The City Mercury or Advertisements Concerning Trade*. This he followed up in 1679 by *Domestick Intelligence, published gratis for the promotion of Trade*.

The day after the departure of James II. was marked by the appearance of three newspapers—*The Universal Intelligencer*, *The English Courant*, and *The London Courant*. Within a few days more these were followed by *The London Mercury*, *The Orange Gazette*, *The London Intelligencer*, *The Harlem Current*, and others. The Licensing Act, which was in force at the date of the Revolution, expired in 1692, but was continued for a year, after which it finally ceased. On the appearance of a paragraph in *The Flying Post* of April 1, 1697, which appeared to the House of Commons to attack the credit of the Exchequer Bills, leave was given to bring in a bill "to prevent the writing, printing, or publishing of any news without license;" but the bill was thrown out in an early stage of its progress.

In 1696 Edward Lloyd—the virtual founder of the "Lloyd's" of commerce—started a thrice-a-week paper, *Lloyd's News*, which had a brief existence, but was the precursor of the *Lloyd's List* of the present day. It was in the reign of Queen Anne that the newspaper press first became really eminent for the amount of intellectual power and of versatile talent which was employed upon it. It was also in that reign that the press

was first fettered by the newspaper stamp. The accession of Anne was quickly followed by the appearance of the first successful London daily newspaper, *The Daily Courant* (1703). Seven years earlier, in 1695, *The Postboy* had been started as a daily paper, but only four numbers appeared. The *Courant* was published and edited by the well-known and learned printer Samuel Buckley. Then came a crowd of new competitors for public favor, of less frequent publication. The first number of one of these, *The Country Gentleman's Courant* (1706), was given away gratuitously.

On February 19, 1704, while still imprisoned in Newgate for a political offense, Defoe began his famous paper *The Review* (see DEFOE). At the outset it was published weekly, afterward twice, at length three times a week, and continued substantially in its first form until July 29, 1712.

The increasing popularity and influence of the newspaper press could not fail to be distasteful to the government of the day. Prosecutions were multiplied, but with small success. At length some busy projector hit upon the expedient of a newspaper tax. The duty eventually imposed was a halfpenny on papers of half a sheet or less, and a penny on such as ranged from half a sheet to a single sheet, and it came into force on July 19, 1712. In 1776 the number of newspapers published in London alone had increased to fifty-three. The history of newspapers during the long reign of George III. is a history of criminal prosecutions, in which individual writers and editors were repeatedly defeated and severely punished, while the press itself derived new strength from the protracted conflict, and turned ignominious penalties into signal triumphs. The three metropolitan newspapers which at different periods of this reign stood preëminent among their competitors were *The Public Advertiser*, *The Morning Post*, and *The Morning Chronicle*. The *Public Advertiser* was first published in 1726, under the title *London Daily Post and General Advertiser*. In 1738 the first part of the title was dropped, and in 1752 *General Advertiser* was altered into the name which the letters of Junius made so famous. It continued to appear until 1798, and was then amalgamated with the commercial paper called *The Public Ledger*, which still exists as a London daily journal. *The Morning Chronicle* was begun in 1769. William Woodfall was its printer, reporter, and editor, and continued to conduct it until 1789. It was sold in 1823 to Mr. Clement, the purchase-money amounting to \$20,000. Mr. Clement held it for about eleven years, and then sold it to Sir John Easthope for \$80,000. It was then, and until 1843, edited by John Black, who numbered among his staff Albany Fonblanque, Charles Dickens, and John Payne Collier. The paper continued to be distinguished by much literary ability, but not by commercial prosperity. In 1849 it became the joint property of the duke of Newcastle, Mr. Gladstone, and some of their political friends; and by them, in 1854, it was sold, conditionally, to Mr. Serjeant Glover, under whose management it became eventually the subject of a memorable public scandal in the law courts of France. At length the affairs of the *Chronicle* were wound up in the Bankruptcy Court of London, after an existence of more than ninety years.

The Morning Post dates from 1772. For some years it was in the hands of Henry Bate (afterward known as Sir Henry Bate Dudley), and it attained some degree of temporary popularity, though of no very enviable sort. In 1795 the entire copyright, with house and printing materials, was sold for \$3,000 to Peter and Daniel Stuart, who quickly raised the position of the *Post* by enlisting Mackintosh and Coleridge in its service, and also by giving unremitting attention to adver-

tisements and to the copious supply of incidental news and amusing paragraphs. It is a striking testimony, not only to Coleridge's powers as a publicist, but to the position which the newspaper press had won, in spite of innumerable obstacles, eighty years ago. The list of his fellow-workers in the *Post* is a most brilliant and varied one. Besides Mackintosh, Southey, and Arthur Young, it included a galaxy of poets. Many of the lyrics of Moore, many of the social verses of Mackworth Praed, some of the noblest sonnets of Wordsworth, were first published in the columns of the *Post*.

The Times is usually dated from January 1, 1788, but was really commenced on January 18, 1785, under the title of *The London Daily Universal Register*, printed logographically.

Within two years Walter, the editor, had his share in the Georgian persecutions of the press, by successive sentences to three fines and to three several imprisonments in Newgate, chiefly for having stated that the prince of Wales and the dukes of York and Clarence had so misconducted themselves "as to incur the just disapprobation of his Majesty." In 1803 he transferred the management (together with the joint proprietorship) of the journal to his son, by whom it was carried on with remarkable energy and consummate tact. Walter, however, was strong and resolute enough to brave the government. He organized a better system of news transmission than had ever before existed. He introduced steam-printing, and repeatedly improved its mechanism.

The effort to secure for *The Times* the best attainable literary talent in all departments kept at least an equal pace with those which were directed toward the improvement of its mechanical resources.

Sir John Stoddart, afterward governor of Malta, edited *The Times* for several years prior to 1816. He was succeeded by Thomas Barnes, under whose management the great journal became famous for munificent reward of every kind of efficient service. From 1841 to 1877 the chief editor was John Thaddeus Delane. Mr. Delane was followed by Thomas Chenery, who remained in charge until 1884, and was in turn succeeded by the present incumbent.

For a long period after the establishment of *The Times*, no effort to found a new daily London morning newspaper was successful. Setting aside mere class journals like *The Financier* and *The Sportsman*, the only existing London morning newspapers which have been founded during the present century are *The Daily News* (January 21, 1846), *The Daily Telegraph* (June 29, 1855), and *The Standard* (June 29, 1857).

London possessed no daily evening paper until 1788, nor did any evening paper attain an important position until the period of the war with Napoleon, when *The Courier* (established in 1792) became the newspaper of the day. For a few years its circulation exceeded that of *The Times*. London has now seven evening papers, one of which—*The Shipping and Mercantile Gazette*—is exclusively commercial. While, of the distinctively political morning journals, four are Liberal and only two Conservative, of the six political evening ones, four are Conservative (*Globe*, dating from 1803; *Evening Standard*, 1827; *St. James's Gazette*, 1880; *Evening News*, 1881) and two are Liberal (*Pall Mall Gazette*, 1865; and *The Star*, 1887).

The annals of French journalism begin with the *Gazette*, established by Théophraste Renaudot in 1631, under the patronage of Richelieu, and with his active coöperation.

In 1790 the sale of the *Mercur* (established in Paris as the *Mercur Galant*, in 1672), rose very rapidly. It attained for a time a circulation of 13,000 copies. Mira-

beau styled it in debate "the most able of newspapers." Great pains were taken for the collection of statistics and state papers, the absence of which from the French newspaper press had helped to depress its credit as compared with the political journalism of England and to some extent of Germany. But, after August 10, 1792, its publication was suspended.

All this time the *Moniteur* (*Gazette Nationale, ou le Moniteur Universel*) was under the same general management as the *Mercure Française* (so the title had been altered in 1791). The *Moniteur*, however, kept step with the majority of the assembly, the *Mercure* with the minority.

The journalism of the first Revolution has been the theme of many bulky volumes, and their number is still on the increase. The recital of the mere titles of the newspapers which then appeared throughout France fills more than forty pages of larger dimensions than those which the reader has now before him.

In August, 1789, Baudouin began the *Journal des Débats* (edited in 1792 by Louvet) and Marat the *Ami du Peuple* (which at first was called *Le Publiciste Parisien*). The *Moniteur Universel* was first published on November 24th, although numbers were afterward printed bearing date from May 5th, the day on which the states-general first assembled. Camille Desmoulins also commenced his *Révolutions de France et de Brabant* in November, 1789. The *Ami du Roi* was first published in June, 1790, *La Quotidienne* in September, 1792. Of all these prominent journals the *Moniteur* and the *Débats* alone have survived until now.

The consular government began its dealings with the press by reducing the number of political papers to thirteen. At this period the number of daily journals had been nineteen, and their aggregate provincial circulation, apart from the Paris sale, 49,313, an average of 2,600 each.

Under Napoleon the *Moniteur* was the only political paper that was really regarded with an eye of favor. The cheap journalism of Paris began in 1836 (July 1st) with the journal of Girardin, *La Presse*, followed instantly by *Le Siècle*, under the management of Dutacq, to whom, it is said—not incredibly—the original idea was really due.

The rapid growth of the newspaper press of Paris under Louis Philippe will be best appreciated from the fact that, while in 1828 the number of stamps issued was 28,000,000, in 1836, 1843, 1845, and 1846 the figures were 42,000,000, 61,000,000, 65,000,000, and 79,000,000 respectively. At the last-mentioned date the papers with a circulation of upward of 10,000 were (besides the *Moniteur*, of which the circulation was chiefly official and gratuitous) as follows:—*Le Siècle*, 31,000; *La Presse*, and *Le Constitutionnel*, between 20,000 and 25,000; *Journal des Débats* and *L'Époque*, between 10,000 and 15,000.

In 1858 the order of the six leading Parisian papers in point of circulation was: (1) *Siècle*, (2) *Presse*, (3) *Constitutionnel*, (4) *Patrie*, (5) *Débats*, (6) *Assemblée Nationale*. The number of provincial papers exceeded 500.

The principal Parisian newspapers in 1890 may be classified thus:—

a. Organs of the Legitimists, and of the Church of France: *Gazette de France*, *Le Monde*, *L'Union*, *La Defense*, *La Civilisation*, *L'Univers*.

b. Orleanist organs: *Le Moniteur Universel*, *Le Constitutionnel*, *Le Français* (under the auspices of the Duc de Broglie), *Le Soleil*.

c. Bonapartist organ: *Le Pays* (edited at one time by Lamartine).

d. Republican organs: *Journal des Débats*, *Le Temps* (the paper of the republican middle classes, and read largely by Protestants), *Le Siècle* (now of declining importance, Voltairean in tone), *Le XIX. Siècle* (also Voltairean), *La Paix* (M. Grévy's paper), *La Justice*, *Paris*, *La République Française* (founded in 1871 by Gambetta), *Le Parlement* (founded by Dufaure; circulation less than that of *La République*, but political weight considerable).

Printed newspapers in Germany begin with the *Frankfurter Journal*, established in the year 1615, by Egenolph Emmel, a bookseller of Frankfort-on-Main. On the whole, it may be said that the German newspapers were of very small account until after the outbreak of the French Revolution. Nor, indeed, can any journal of a high order be mentioned of prior appearance to the *Allgemeine Zeitung*, founded at Leipsic by the bookseller Cotta (at first under the title of *Neueste Weltkunde*) in 1798, and which is still at the head of the political press of Germany.

In 1879 it was estimated that the total number of newspapers and periodicals published in the German language, in all parts of the world, reached to nearly 5,480—in Germany proper, 3,780; Austria-Hungary, about 700; Switzerland, about 300; Russia, about 50; Great Britain, Netherlands, Belgium, Italy, etc., 40; North America, 600; South America, 9; Africa (Cape Town), 1. In Germany, in foreign languages, there appeared at the same period—in Polish, 26; French, 17; Danish, 10; Wendish, 6; Lithuanian, 2; English, 2; Hebrew, 4; total, 67.

The *National Zeitung*, published at Berlin, holds a conspicuous place among existing German newspapers. Dr. Bernhard Wolff, who founded it (also in 1848), continued to be chief editor until his death in 1879. He was a notable precursor (only a little in advance) in telegraphic enterprise of Julius Reuter; and, to some extent, his telegraphic bureau at Berlin may be regarded as the germ at once of the "Agence Havas" and of "Reuter's telegrams." Like Reuter, he found it expedient, as the affair grew, to turn it over to a company. He did so in 1864, but continued to work the enterprise until 1871. Of strictly political papers, the *Volkszeitung* is probably that which has the largest circulation of all Germany.

As regards the socialistic press, "German socialism," says Sorel, "has turned journalist." It has established fourteen printing-offices, and publishes forty-one political journals, thirteen of which are of daily publication."

At the beginning of 1840 the whole number of Austro-German and Hungarian periodicals, of all sorts, was less than 100, only twenty-two being (after a fashion) political newspapers; and of these nearly all drew their materials and their inspiration from the official papers of Vienna (*Wiener Zeitung* and *Oesterreichischer Beobachter*). These two were all that appeared in the capital.

Vienna has in all eighteen daily newspapers (really such), ten of which range in average circulation from 14,000 to 54,000 copies, and, according to the consular returns collected by Hubbard, no less than 483 periodicals of all kinds, and of all periods of issue. Of 1,016 journals, classified as to language, 600 appear in German, 170 in Hungarian, 79 in Bohemian, 58 in Polish, 56 in Italian, 22 in Slovenian, 11 in Croatian and Servian, 9 in Ruthenian, 8 in Roumanian, 3 in Hebrew. Budapest claims to have 229 journals, and Prague 99, counting those of all descriptions.

Boston was the first city of America that possessed a local newspaper; but the earliest attempt in that direction, made in 1689, and a second attempt under the title *Public Occurrences* which followed in September,

1690, were both suppressed by the government of Massachusetts. *The Boston Gazette* began in 1719. James Franklin, elder brother of the celebrated Benjamin Franklin, was its first printer. It lasted until the end of 1754, its editorship usually changing with the change of the postmasters. On August 17, 1721, James Franklin started *The New England Courant*, the publication of which ceased in 1727; and two years later Benjamin Franklin established *The Pennsylvania Gazette*, which he continued weekly until 1765.

To *The Boston Gazette* and the *Courant* succeeded *The New England Weekly Journal* (March 20, 1727; incorporated with *The Boston Gazette* in 1741), and *The Weekly Rehearsal* (September 27, 1731), which became *The Boston Evening Post* (August, 1735), and under that title was for a time the most popular of the Boston newspapers.

William Lloyd Garrison's once well-known *Boston Liberator* was founded on New Year's Day, 1831. For a time its editor was also writer, compositor, and pressman. He continued the paper to the last day of 1861, and lived to witness the abolition of negro slavery.

At the commencement of the struggle for independence in 1775 Massachusetts possessed seven newspapers, New Hampshire one (*The New Hampshire Gazette*, founded in 1756), Rhode Island two, and Connecticut three—making thirteen in all for the New England colonies. Pennsylvania had eight, of which the earliest in date was *The American Weekly Mercury* (No. 1, December 22, 1719); and New York but three, the oldest of them being *The New York Gazette*, the publication of which had commenced on October 16, 1725. Up to that period (1725) Boston and Philadelphia were the only towns possessing a newspaper throughout America. The total number of Anglo-American papers was thirty-four, and all of them were of weekly publication.

The New Hampshire Gazette still exists, and is the "father" of the New-England press.

Virginia, notwithstanding its illustrious precedence—the province of Raleigh, the cradle of Washington—possessed neither newspaper nor printing-office until 1736, so that (as respects one-half at least of the wish) there was once a prospect that the devout aspiration of Sir William Berkeley might be realized, "Thank God," said this Virginian governor in 1671, "we have neither free school nor printing press, and I hope may not have for a hundred years to come." The earliest journal established in the State was *The Virginia Gazette*, commenced in 1736. *The Richmond Inquirer*, which started in 1804, early attained a leading position. The first daily newspaper published in the city or State of New York was *The New York Journal and Register*, commenced in 1788. In 1810 the aggregate number of papers published within the State was sixty-six, of which fourteen belonged to New York city. Ten years later the city press included eight daily journals, with an aggregate daily circulation of 10,800 copies. No one paper circulated more than 2,000, and but two—*The Evening Post* and *The Commercial Advertiser*—attained that number.

The penny press of America began in New York, and the pioneer was *The Daily Sun* (No. 1, September 23, 1833), written, edited, set up, and worked off by Benjamin Franklin Day, a journeyman printer. Its circulation at first was 600 copies. *The New York Herald* followed in May, 1835. Exceptional and eccentric forms of advertisement were persistently used to gain notoriety for the new paper, and its commercial success was great. Within twenty years it had attained a circulation of 36,158 copies—which was at that date about five times the circulation of any London newspaper, *The*

Times only excepted—and the issue has since greatly increased. *The New York Tribune* was established in 1841 by Horace Greeley, who remained its editor and one of its proprietors until his death, shortly after his defeat for the presidency in 1872. It was also, at the outset, a penny paper, but it differed from its cheap rivals in being a vigorous political propagandist, and in giving hospitable attention to literature and to novel ideas in social and political economy. *The Tribune* made the first great use of the Atlantic cables for transmitting war correspondence, in its voluminous reports of the Franco-Prussian war. Another of its notable feats was the translation of the "cipher dispatches," revealing the effort by some of Mr. Tilden's partisans to purchase electoral votes for him, in the disputed presidential election of 1876. *The New York Times* was established by Henry J. Raymond in September, 1851. Its greatest good fortune came after the death of its founder, in its discovery and vigorous exposure of the frauds and robberies committed by the "Tweed Ring," in the municipal government of New York, a work for which it received great praise and profit.

The prices of the more important New York papers were advanced to three, and finally, during the war of the Rebellion, to four cents. They all came to make regular issues on Sunday also, when the price was generally five cents. In September, 1883, the *Times* suddenly reduced its price from four to two cents. *The Herald* did the same; but the *Tribune* stopped at three cents. There are also several one-cent papers, with considerable circulations. Their inroads upon the larger journals, and that from the *World*, an eight-page Democratic newspaper sold at two cents, are supposed to have forced the reductions in price above named, which are obviously to make a great change both in the character and prosperity of the press of New York.

The New York Associated Press is the chief news agency of the American continent. It is a partnership between the *Herald*, *Tribune*, *Times*, *Sun*, *World*, *Journal of Commerce*, and *Mail and Express*, for the collection of such news as its members may wish to use in common, and the sale of it to others. This and the Western Associated Press—an organization of a large number of the more important newspapers of Chicago, Cincinnati, St. Louis, and other cities in the Mississippi valley—are now consolidated in a working arrangement, under the management of a permanent joint executive committee, who appoint agents, contract with telegraph companies, distribute the news to the members of the two associations, and sell it to a great number of individual papers and other associations. They transmit proceedings of Congress and the State legislatures, public documents, market news, the dispatches by ocean cables, and, in general, accounts of all public occurrences of interest.

Until the reductions of 1883, the prevailing price for first-class papers, of eight or more pages, was, in New York, four cents; in Chicago, Cincinnati, St. Louis, and elsewhere, five cents. The past ten years, however, had been notable for the growth of another class of journals, of about half the size, generally of only four pages, which aimed at a greater condensation of routine news, and often at giving special prominence to "sensations." These were sold at two cents, and frequently attained great success. The *New York Sun*, *Boston Herald*, *Philadelphia Times*, *Chicago News*, and *San Francisco Chronicle* were good examples. Equally successful, if generally less sensational, were the *Philadelphia Ledger*, *Baltimore Sun*, *Washington Star*, and *San Francisco Call*. The wide circulation and handsome profits of this class of journals have developed a considerable reaction against large papers, extreme full

ness of news detail, and long editorial comment. Most of the newspapers started or projected now are of the one-cent class.

The great distances in the United States, the excellent and cheap telegraphic service, and the facilities afforded by the Associated Press combine to promote the growth of what would be called in England "provincial journals." Cincinnati, Chicago, and St. Louis, being each over a day's and a night's journey from New York, Boston, or Philadelphia, are able to build up first-class papers of their own. In Chicago the *Tribune*, *Times*, *Inter-Ocean*, and *Record-Herald* are strong, enterprising eight-page journals, often sending out double or sixteen-page sheets, maintaining large corps of correspondents, and leasing private wires from New York and Washington. Substantially the same may be said of the *Commercial-Tribune* and the *Enquirer* of Cincinnati, of the *Globe-Democrat* and the *Republic* of St. Louis, and of the *Times-Democrat* of New Orleans.

Nearly every town of 15,000 inhabitants has its own daily paper. Scarcely a "county seat" in the settled part of the United States is without its weekly paper—even if the population should be below 1,000. In the older counties, villages of a few hundred inhabitants in the "out-townships" are also apt to have a weekly. These are often of the class known as "patent outsides," for which the first and fourth pages, composed of reprint matter and advertisements, are made up and printed in a central office, doing such work by wholesale for hundreds of papers, while the half-printed sheets are then forwarded to the local office, to be filled out with village news and advertisements.

The total number of periodical publications issued in the United States and Canada is reported at almost 22,000 (21,827 in 1901). Of these there are nearly 1,800 dailies and over 13,800 weeklies. New York, Pennsylvania, and Illinois in their order lead in the number of newspapers.

NEWTON, a city in Middlesex county, Mass., about eight miles west of Boston, on the south bank of the Charles river. It is divided into seven wards, and contains the post-villages of Auburndale, Chestnut Hill, Newton, Newton Centre, Newton Highlands, Newton Lower Falls, Newton Upper Falls, Newtonville, West Newton, and Nonantum. Newton is principally inhabited by Boston merchants, and, each village being a collection of fine residences with beautiful grounds, it has been designated "the Garden City of New England." The water-power furnished by the river is turned to account by numerous manufactories producing paper, hosiery, dyestuffs, emery paper, ink, soap, shoddy, etc. The first Baptist theological seminary in America was established in Newton Centre in 1826; it is now a flourishing institution with a library of 15,000 volumes, and five resident professors. Laselle Female Seminary at Auburndale dates from 1851. First settled in 1630, Newton was incorporated as a town in 1679, as a city in 1873. Its population was 3,351 in 1840, 8,382 in 1860, 12,825 in 1870, and 33,587 in 1900.

NEWTON, a town of Harvey county, Kan., twenty-seven miles north of Wichita, with a population (1900) of 6,208. It has good railroad and telegraph facilities, banks, schools, and churches, and is the central point of an important coal-field.

NEWTON, SIR ISAAC, one of the greatest of natural philosophers, was born December 25, 1642 (O.S.), at Woolsthorpe, a hamlet in the parish of Colsterworth, Lincolnshire, about six miles from Grantham. His father (also Isaac Newton) was the farmer of a small freehold property of his own. After having acquired the rudiments of education at two small schools in ham-

lets in close proximity to Woolsthorpe, Newton was sent at the age of twelve to the grammar school of Grantham, in the house of Mr. Clark. According to his own confession he was far from industrious, and stood very low in his class. His mother's brother, Mr. W. Ayscough, the rector of the next parish, was a graduate of Trinity College, Cambridge, and when he found that Newton's mind was wholly devoted to mechanical and mathematical problems, he urged upon his mother the desirability of sending her son to his own college, a proposal to which she was not at all unwilling to give her consent. He was accordingly admitted a member of Trinity College on June 5, 1661, as a subsizar, and was matriculated on July 8th. We have scarcely any information as to his attainments when he commenced residence, and very little as to his studies at the university before he took the degree of bachelor of arts. It is reported that in his examination for a scholarship at Trinity, to which he was elected on April 28, 1664, he was examined in Euclid by Dr. Barrow, who formed a poor opinion of his knowledge, and that in consequence Newton was led to read the *Elements* again with care, and thereby to form a more favorable estimate of Euclid's merits.

The study of Descartes' *Geometry* seems to have inspired Newton with a love of the subject, and to have introduced him to the higher mathematics. In the month of January, 1665, Newton took the degree of bachelor of arts.

Newton was elected a fellow of his college on October 1, 1666. There were nine vacancies, one of which was caused by the death of Cowley in the previous summer, and the nine successful candidates were all of the same academical standing. A few weeks after his election to a fellowship Newton went to Lincolnshire, and did not return to Cambridge till the February following. On March 16, 1668, he took his degree of M.A.

During the years 1666 to 1669 Newton's studies were of a very varied kind. It is known that he purchased prisms and lenses on two or three several occasions, and also chemicals and a furnace, apparently for chemical experiments; but he also employed part of his time on the theory of fluxions and other branches of pure mathematics. He wrote a paper, *Analysis per Equationes Numero Terminorum Infinitas*, which he put, probably in June, 1669, into the hands of Isaac Barrow (then a fellow of Trinity College, and the first occupant of the Lucasian chair of mathematics). Shortly afterward Barrow, who had resolved to devote his attention to theological in preference to mathematical studies, resigned the Lucasian chair, and was instrumental in securing Newton's election as his successor. Newton was elected Lucasian professor on October 29, 1669. It was his duty as professor to lecture at least once a week in term time on some portion of geometry, arithmetic, astronomy, geography, optics, statistics, or some other mathematical subject, and also for two hours in the week to allow an audience to any student who might come to consult with the professor on any difficulties he had met with. The subject which Newton chose for his lectures was optics. On December 21, 1671, he was proposed as a candidate for admission into the Royal Society by Dr. Seth Ward, bishop of Salisbury, and on January 11, 1672, he was elected a fellow of the Society.

It is supposed that it was at Woolsthorpe, in the summer of 1666, that Newton's thoughts were directed to the subject of gravity. Voltaire is the authority for the well-known anecdote about the apple. He had his information from Newton's favorite niece, Catharine Barton, who married Conduitt, a fellow of the Royal

Society, and one of Newton's intimate friends. How much truth there is in what was a plausible and a favorite story can never be known, but it is certain that tradition marked a tree as that from which the apple fell, till 1820, when, owing to decay, the tree was cut down and its wood carefully preserved.

In January, 1684, Sir Christopher Wren, Halley, and Hooke were led to discuss the law of gravity, and, although probably they all agreed in the truth of the law of the inverse square, yet this truth was not looked upon as established. It appears that Hooke professed to have a solution of the problem of the path of a body moving around a center of force attracting as the inverse square of the distance; but Halley, finding, after a delay of some months, that Hooke "had not been so good as his word" in showing his solution to Wren, started, in the month of August, 1684, for Cambridge to consult Newton on the subject. Without mentioning the speculations which had been made, he went straight to the point and asked Newton what would be the curve described by a planet around the sun on the assumption that the sun's force diminished as the square of the distance. Newton replied promptly, "an ellipse," and on being questioned by Halley as to the reason for his answer he replied, "Why, I have calculated it." He could not, however, put his hand upon his calculation, but he promised to send it to Halley. After the latter had left Cambridge, Newton set to work to reproduce the calculation. After making a mistake and producing a different result he corrected his work and obtained his former result.

The years 1685 and 1686 will ever be memorable in the history of science. It was then that Newton first composed almost the whole of his great work. During this period Newton had a very extensive correspondence with Flamsteed, who was then the astronomer-royal. Many of the letters are lost, but it is clear from one of Newton's, dated September 19, 1685, that he had received many useful communications from Flamsteed, and especially regarding Saturn, "whose orbit, as defined by Kepler," Newton "found too little for the sesquialterate proportions." In the other letters written in 1685 and 1686 he applies to Flamsteed for information respecting the orbits of the satellites of Jupiter and Saturn, respecting the rise and fall of the spring and neap tides at the solstices and the equinoxes, respecting the flattening of Jupiter at the poles (which, if certain, he says, would conduce much to the stating the reasons of the precession of the equinoxes), and respecting the difference between the observed places of Saturn and those computed from Kepler's tables about the time of his conjunction with Jupiter. On this last point the information supplied by Flamsteed was peculiarly gratifying to Newton; and it is obvious from the language of this part of the letter that he had still doubts of the universal application of the sesquialterate proportion.

Upon Newton's return from Lincolnshire in the beginning of April, 1685, he seems to have devoted himself to the preparation of his work. In the spring he had determined the attractions of masses, and thus completed the law of universal gravitation. In the summer he had finished the second book of the *Principia*, the first book being the treatise *De Motu*, which he had enlarged and completed. Excepting in the correspondence with Flamsteed, to which we have already referred, we hear nothing more of the preparation of the *Principia* until April 21, 1686, when Halley read to the Royal Society his *Discourse Concerning Gravity and its Properties*, in which he states "that his worthy countryman Mr. Isaac Newton has an incomparable treatise of motion almost ready for the press," and that the law of the inverse square "is the principle on which Mr. New-

ton has made out all the phenomena of the celestial motions so easily and naturally that its truth is past dispute." The intelligence thus given by Halley was speedily confirmed. At the very next meeting of the Society, on April 28th, "Doctor Vincent presented to the Society a manuscript treatise entitled *Philosophia Naturalis Principia Mathematica*, and dedicated to the Society by Mr. Isaac Newton."

On June 30, 1686, the president was desired by the council to license Mr. Newton's book, entitled *Philosophia Naturalis Principia Mathematica*. The printing of the *Principia* was commenced, and went on with considerable regularity. The second book, though ready for the press in the autumn of 1686, was not sent to the printers until March, 1687. The third book was presented to the Society on April 6, 1687, and the whole work published about midsummer in that year. It was dedicated to the Royal Society, and to it was prefixed a set of Latin hexameters addressed by Halley to the author. The work, as might have been expected, caused a great deal of excitement throughout Europe, and the whole of the impression was very soon sold. In 1691 a copy of the *Principia* was hardly to be procured.

The active part which Newton took in defending the legal privileges of the university against the encroachments of the crown had probably at least equal weight with his scientific reputation when his friends chose him as a candidate for a seat in parliament as one of the representatives of the university. Newton retained his seat only about a year, from January, 1689, till the dissolution of the Convention Parliament in February, 1690. During this time Newton does not appear to have taken part in any of the debates in the House; but he was not neglectful of his duties as a member. On April 30, 1689, he moved for leave to bring in a bill to settle the charters and privileges of the university of Cambridge, just as Sir Thomas Clarges did for Oxford at the same time, and he wrote a series of letters to Dr. Lovel, the vice-chancellor of the university, on points which affected the interests of the university and its members.

During his residence in London Newton had made the acquaintance of John Locke. Locke had taken a very great interest in the new theories of the *Principia*. He was one of a number of Newton's friends who began to be uneasy and dissatisfied at seeing the most eminent scientific man of his age left to depend upon the meager emoluments of a college fellowship and a professorship.

At one time Newton's friends had nearly succeeded in getting him appointed provost of King's College, Cambridge, but the college offered a successful resistance on the ground that the appointment would be illegal, as the statutes required that the provost should be in priest's orders. Charles Montague, who was afterward earl of Halifax, was a fellow of Trinity College, and was a very intimate friend of Newton's; and it was on his influence that Newton relied in the main for promotion to some post of honor and emolument. His hopes, however, were blighted by long delay. But this blot upon the English name was at last removed by Montague in 1694, when he was appointed chancellor of the exchequer. He had previously consulted Newton upon the subject of the recoinage, and on the opportunity occurring he appointed Newton to the post of warden of the mint. The chemical and mathematical knowledge of Newton proved of great use in carrying out the recoinage. This was completed in about two years, and such was the zeal and devotion with which Newton discharged the laborious duties of his office that he was in 1697 appointed to the mastership of the mint, a post worth between \$6,000 and \$7,500 per annum. While he held the latter office,

Newton drew up a very extensive table of assays of foreign coins, and composed an official report on the coinage.

Up to the time of the publication of the *Principia* in 1687 the method of fluxions which had been invented by Newton, and had been of great assistance to him in his mathematical investigations, was still, except to Newton and his friends, a secret. One of the most important rules of the method forms the second lemma of the second book of the *Principia*.

In the year 1707 Whiston published the algebraical lectures which Newton had delivered at Cambridge, under the title of *Arithmetica Universalis, sive de Compositione et Resolutione Arithmetica Liber*. In mentioning the mathematical works of our author, we must not omit his solution of the celebrated problems proposed by John Bernoulli and Leibnitz. In the year 1699 Newton's position as a mathematician and natural philosopher of the first order was recognized in a very honorable manner by the French Academy of Sciences. In that year the Academy was remodeled, and eight foreign associates were created.

While Newton held the office of warden of the mint, he retained his chair of mathematics at Cambridge, and discharged the duties of the post, but shortly after he was promoted to the more lucrative office of master of the mint he appointed Whiston his deputy with "the full profits of the place." Whiston began his astronomical lectures as Newton's deputy in January, 1701. On December 10, 1701, Newton resigned his professorship, thereby at the same time resigning his fellowship at Trinity, which he had held with the Lucasian professorship since 1675 by virtue of the royal mandate. Whiston's claims to succeed Newton in the Lucasian chair were successfully supported by Newton himself.

On November 26, 1701, Newton was again elected one of the representatives of the university in parliament, but he retained his seat only until the dissolution in the following July.

In the autumn of 1703 Lord Somers retired from the post of president of the Royal Society, and Newton on November 30, 1703, was elected to succeed him. Newton was annually reelected to this honorable post during the remainder of his life. He held the office in all twenty-five years, a period in which he has been exceeded by but one other president of the Royal Society, Sir Joseph Banks. In April, 1705, when Queen Anne and the court were staying at the royal residence at Newmarket, they paid a visit to Cambridge, where they were the guests of Doctor Bentley, the master of Trinity. Her majesty went in state to the Regent House, where a congregation of the senate was held, and a number of honorary degrees conferred. Afterward the queen held a court at Trinity Lodge, where (April 16, 1705) she conferred the order of knighthood upon the most distinguished of her subjects, the noblest knight who ever won his spurs in science, Sir Isaac Newton.

As soon as the first edition of the *Principia* was published Newton began to prepare for a second edition. He was anxious to improve the work by additions to the theory of the motion of the moon and the planets. At last, about midsummer, 1713, was published the long and impatiently expected second edition of the *Principia*, and on July 27th Newton waited on the queen to present her with a copy of the new edition.

In 1714 the question of finding the longitude at sea, which had been looked upon as an important one for several years, was brought into prominence by a petition presented to the House of Commons by a number of captains of Her Majesty's ships and merchant-ships and of London merchants. This petition set forth "that

the discovery of longitude is of such consequence to Great Britain, for safety of the navy, for merchant-ships, as well as of improvement of trade, that for want thereof many ships had been retarded in their voyages, and many lost; but if due encouragement were proposed by the public for such as shall discover the same, some persons would offer themselves to prove the same before the most proper judges." The petition was referred to a committee of the House, who called witnesses. Newton appeared before them and gave evidence. He stated that for determining the longitude at sea there had been several projects, true in theory, but difficult to execute. He mentioned four: (1) by a watch to keep time exactly; (2) by the eclipses of Jupiter's satellites; (3) by the place of the moon; (4) by a new method proposed by Mr. Ditton. Newton criticised all the methods, pointing out their weak points, and it is due mainly to his evidence that the committee brought in the report which was accepted by the House, and shortly afterward was converted into a bill, passed both Houses, and received the royal assent. The report ran "that it is the opinion of this committee that a reward be settled by parliament upon such person or persons as shall discover a more certain and practicable method of ascertaining the longitude than any yet in practice; and the said reward be proportioned to the degree of exactness to which the said method shall reach." For the history of the consequences of this report we must refer to the article NAVIGATION.

From an early period of his life Newton had paid great attention to theological studies, and it is well known that he had begun to study the subject of the prophecies before the year 1690. M. Biot, with a view of showing that his theological writings were the productions of his dotage, has fixed their date between 1712 and 1719. That Newton's mind was even then quite clear and powerful is sufficiently proved by his ability to attack the most difficult mathematical problems with success. For it was in 1716 that Leibnitz, in a letter to the Abbé Conti, proposed a problem for solution "for the purpose of feeling the pulse of the English analysts." The problem was to find the orthogonal trajectories of a series of curves represented by a single equation. Newton received this problem about five o'clock in the afternoon as he was returning from the mint, but, though he was fatigued with business, he solved the problem the same evening.

Sir Isaac Newton left behind him in manuscript a work entitled *Observations on the Prophecies of Daniel and the Apocalypse of St. John*, which was published in London in 1733, in one volume 4to; another work, entitled *Lexicon Propheticum*, with a dissertation on the sacred cubit of the Jews, which was printed in 1737; and four letters addressed to Bentley, containing some arguments in proof of a Deity, which were published by Cumberland, a nephew of Bentley, in 1756. Sir Isaac also left a *Church History* complete, a *History of the Creation*, *Paradoxical Questions regarding Athanasius*, and many divinity tracts.

Newton devoted much of his time to the study of chemistry; but the greater number of his experiments still remain in manuscript. His *Tabula Quantitatum et Graduum Caloris* contains a comparative scale of temperature from that of melting ice to that of a small kitchen fire. He wrote also another chemical paper, *De Natura Acidorum*, which has been published by Doctor Horsley. Sir Isaac spent much time in the study of the works of the alchemists.

In the last few years of his life Newton was troubled with incontinence of urine, which was supposed to be due to stone; but with care he kept the disease under control. In January, 1725, he was seized with a violent

cough and inflammation of the lungs, which induced him to reside at Kensington; and in the following month he had a severe attack of gout, which produced a decided improvement in his general health. His duties at the mint were discharged by Mr Conduitt, and he therefore seldom went from home. On February 28, 1727, he went to London to preside at a meeting of the Royal Society; but the fatigue which attended this duty brought on a violent return of his former complaint, and he returned to Kensington on March 4th, when Doctor Mead and Doctor Cheselden pronounced his disease to be stone. He endured the sufferings of this complaint with wonderful patience and meekness, and died on Monday, March 20, 1726-27, in the eighty-fifth year of his age. His body was removed to London, and on Tuesday, March 28th, it lay in state in the Jerusalem Chamber, and was thence conveyed to Westminster Abbey, where it was buried.

NEWTON, JOHN, a prominent Evangelical clergyman of the Church of England, and an intimate friend of the poet Cowper, was born in London July 24, 1725, and died in 1807.

Like his friend, the poet Cowper, Newton held strongly Calvinistic views, although his evangelical fervor allied him closely with the sentiments of Wesley and the Methodists. His enduring fame rests on certain of the *Olney Hymns*, remarkable for vigor, simplicity, and directness of devotional utterance, which have passed into almost universal currency throughout the Reformed churches of English speech.

NEWTON ABBOT and NEWTON BUSHEL are generally included under the name Newton Abbot, a market-town of Devonshire, England, on the Teign, five miles south by west of Teignmouth, and six north of Torquay. Population, about 10,000.

NEWTON-LE-WILLOWS, or NEWTON-IN-MAKERFIELD, township and urban sanitary district of Lancashire, England, between Liverpool and Manchester. The population of the urban sanitary district in 1871 was 8,244, and in 1901 it was about 12,000.

NEWTOWN (Welsh, *Drefnewydd*; ancient name, *Llanfair Cedewain*), a market-town and parliamentary borough of Montgomeryshire, Wales, is situated on both sides of the Severn, eleven miles east-northeast of Llanidloe, and thirteen south-southwest of Welshpool. It is a well-built town with wide and regular streets, although some of the houses are of timber. Population, 8,000.

NEWTOWN, a suburban municipal district of Sydney, New South Wales. It consists chiefly of the residences of the better classes, whose business premises are in the city. It possesses a town hall, a good free library, and a new courthouse. Newtown is connected with Sydney by railway, tramway, and omnibus. The population is 20,000.

NEWTOWARDS, or NEWTOWNARDES, a market-town, formerly a parliamentary borough, of the County Down, Ireland, nine and one-half miles east of Belfast, and four and one-half south by west of Bangor. Population, 9,000.

NEW YEAR'S DAY. The first day (*calends*) of January, a. marking the beginning of the year, was observed as a public holiday in Rome from at least the time of the Julian reformation of the calendar. Ovid alludes to the abstinence from litigation and strife, the smoking altars, the white-robed processions to the Capitol; and later writers describe the exchanges of visits, the giving and receiving of presents (*strenæ*), the masquerading, and the feasting with which the day was in their time celebrated throughout the empire. Libanius (c. 346 A.D.) speaks of it as being in his day the one great holiday common to all under the Roman rule.

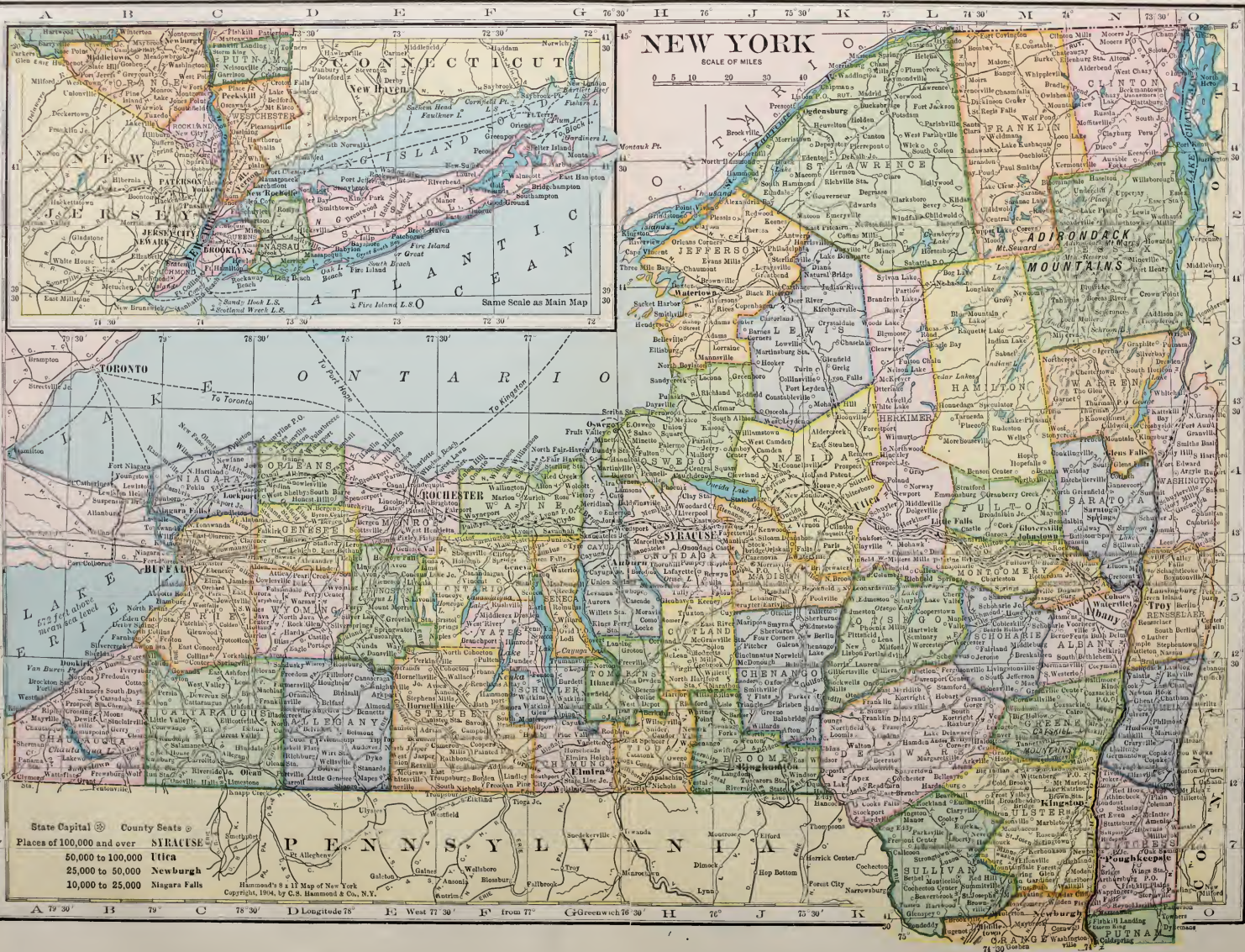
When, about the fifth century, the 25th of December had gradually become a fixed festival commemorative of the Nativity, the 1st of January ultimately also assumed a specially sacred character as the octave of Christmas Day and as the anniversary of the circumcision of our Lord, and as such it still figures in the calendars of the various branches of the Eastern and of the Western Church, though only as a feast of subordinate importance. For particulars as to the date of commencement, and also as to the duration, of the year, whether civil or sacred, in various nations and religions, reference may be made to the article CALENDAR.

NEW YORK, one of the original thirteen United States of America, is bounded north by Lake Ontario and the St. Lawrence river, which separate it from the province of Ontario; east by Vermont, Massachusetts, and Connecticut; south by the Atlantic Ocean, New Jersey, and Pennsylvania; and west by Pennsylvania, Lake Erie, and the Niagara river.

The State of New York has a triangular outline, with a breadth from east to west of 326.46 miles, and from north to south, on the line of the Hudson, of 300 miles. In addition it includes Long Island and Staten Island on the Atlantic coast. Its area is 49,170 square miles—47,620 square miles, or 30,476,800 acres, being land, and the remainder portions of the great lakes that border it. The surface is more diversified than that of any other State in the Union. The eastern and southern portions are high, and from these the land slopes gently north and west to Lake Ontario. The mountainous belt of the eastern part is cut through by the great water-gap of the Mohawk valley, which once connected the Ontario basin with the trough of the Hudson below the present ocean-level, and is the most interesting and important feature in the topography of the State.

The mountains of New York form three distinct groups. (1) The Adirondacks, a series of short ranges having a north-northeast and south-southwest direction, from the center of the elevated region of the northeast section of the State. The highest of these is Mount Marcy, 5,344 feet, with several associated summits which reach the altitude of 5,000 feet. (2) The Catskill Mountains, with their foothills, occupy about 500 square miles south of the Mohawk valley and west of the Hudson; the highest peaks reach an altitude of 4,000 feet. The Helderberg and Shawangunk Mountains are topographically a portion of the Catskills, the first on the north, the second on the south. These all belong to the Alleghany system, and are connected with the mountains of Pennsylvania by the Delaware Mountains, which have an altitude of from 1,600 to 2,800 feet. (3) The Highlands of the Hudson, through which the river passes at West Point, are the northern continuation of the Blue Ridge of Pennsylvania, having an altitude of from 1,200 to 1,800 feet. The so-called mountains of the central and southern counties are portions of a high plateau which connects with the Helderberg and Catskill Mountains on the east. This is cut by eroded valleys in such a way as to leave many elevated points, of which the highest is East Hill in Otsego county, 2,300 feet above the sea. One of the most peculiar and impressive topographical features is formed by the cliffs of the Palisades, which border the Hudson in Rockland county, and are continuous with those of New Jersey.

Two of the chain of great lakes border the State, Lake Erie and Lake Ontario, connected by the Niagara river, on which is the most celebrated cataract in the world. Lake Erie gives about seventy-five miles of coast-line to New York, Lake Ontario over 200. The surface-level of the former is 573 feet above the sea, of the latter 245 feet; and this is 606 feet deep. A portion of the eastern



border of New York is formed by Lake Champlain, which lies in the trough between the Adirondacks and the Green Mountains. Within the State the number of lakes is very great. The largest is Lake George, famous for its beautiful scenery. Through the central portion a series of peculiar elongated lakes are found which lie with a nearly north-and-south bearing on the slope from the southern highlands to the Ontario basin, or the Mohawk valley. The largest of these are Cayuga, Seneca, Oneida, Crooked, Canandaigua, Owasco, and Otsego. The Adirondack region is famous for its system of lakes, which are favorite places of resort for tourists. Among the rivers of New York the Hudson is the largest and most beautiful. Formerly it ran several hundred feet below its present level, and was the great channel of drainage which led through the Mohawk valley from the interior. Now, by a subsidence of the continent, it is an arm of the sea, and navigable to Troy, 151 miles from its mouth. The Black River, the Mohawk, and the Genesee are all large streams which lie entirely within the State, while the Alleghany, the Susquehanna, and the Delaware rise there, but soon leave it to become the great rivers of Pennsylvania. From the varied topography and the abundant rainfall the number of streams is large, and many of them are marked by picturesque falls. Besides the great cataract of Niagara, a mile wide and 164 feet high, which New York shares with Canada, there are many other falls worthy of mention, as those of the Genesee at Rochester and Portage, Trenton Falls, the Falls of Ticonderoga, etc. Among the natural features which distinguish the State its mineral springs deserve special mention. Those of Saratoga, Ballston, Sharon, Avon, and Richfield are famous throughout the Union. They differ much in chemical composition and medicinal virtues, but all are popular places of resort, and some have gathered round them towns of considerable size.

In a general way it may be said that the climate of New York is typical of that of the northern United States, a climate of extremes, hot in summer and cold in winter, and yet healthful, stimulating, and on the whole not disagreeable. The average annual temperature is about 47° Fahr., the average maximum of summer heat 93°, the temperature of 100° being rarely reached, and 102° the highest maximum record. The minimum temperature is about -20° Fahr., never attained in the southern portion, seldom in the central, but often passed by four or five degrees in the most northern counties. The average rainfall is about forty inches. Frosts begin from September 1st to October 1st, and end from April 1st to May 1st, according to the locality and year. In the Adirondack region the snowfall is heavy, the winter long and severe. In central New York it is not uncommon for snow to accumulate to the depth of three or four feet, and yet this is not persistent. About New York city and on Long Island the snow rarely exceeds a foot in depth, sleighing is always uncertain, and sometimes the ground will be bare for weeks together.

In the absence of extensive alluvial plains and marshes, there is little malaria, and the climate is salubrious. About New York city and on Long Island the ocean softens the rigors of winter, and through the influence of the Arctic current, which bathes the coast as far south as Cape Hatteras, renders the summer perceptibly cooler. At the advent of the whites the fauna of New York included all the wild animals which were found in the northeastern States of the Union or the adjacent portions of Canada, but by the cutting off of forests, and the occupation of the surface by farms, the range of the native animals has been greatly reduced, and they have been unceasingly destroyed by man.

Formerly the elk, the moose, and the caribou were abundant in the northern part of the State, but they are now all exterminated, while the Virginia deer in many localities is still plentiful. Of the carnivorous animals, the cougar, the black bear, two species of lynx, the red and gray foxes, the wolf, otter, fisher, pine marten, mink, and skunk still remain, but the wolf is on the eve of extermination, and the wolverine, never abundant, have migrated northward. Among the rodents the beaver and variable hare are found, but in small numbers, while rabbits, squirrels, rats, mice, fieldmice, etc., are still unpleasantly numerous.

Civilization has made but little difference with the reptiles birds, and fishes. All the birds indigenous to the eastern portion of the continent may at times be found within the State, though their native numbers are affected by the removal of the forests. Among the reptiles are seventeen species of snakes, three of which, two rattlesnakes and one copperhead, are venomous. The fishes include all the species found in the lower lakes, in the rivers of the temperate portions of the continent, and on the Atlantic coast; and the fisheries constitute an important element in the revenues and subsistence of the people. The oyster industry of the coast has its chief commercial center in New York city, and an important fraction of the supply of clams, oysters, lobsters, and sea fish is obtained from the New York coast.

Originally the surface of New York was occupied by an almost unbroken forest, and, as a consequence of a general fertility of the soil, its topographical diversity, and the range of latitude and longitude, the flora is rich and varied. About seventy species of trees are known to inhabit the State, and these include all found in the adjacent portions of the Union and Canada. The most abundant are oaks, of which there are fifteen species, five species each of maple, pine, and poplar, four species of hickory, three each of elm, spruce, and ash, two of willow, cherry, magnolia, and pepperidge, and one each of larch, liriiodendron, dogwood, arbor vitæ, balsam, yew, sycamore, honey locust, sweet gum, locust, butternut, black walnut, chestnut, beech, hornbeam, basswood, sassafras, and mulberry. On the summits of the Adirondacks a true alpine vegetation is found, though consisting of but a small number of plants.

The mineral resources of New York, though less varied than those of some other States, are still of great importance. The most valuable of these are extensive deposits of iron ore, viz.: (1) magnetite, found in great abundance in the Adirondack region, and in Putnam, Orange, and Rockland counties; (2) hematite, mined in the vicinity of Rosie (St. Lawrence county), Clinton (Oneida county), and elsewhere; (3) limonite, largely worked on Staten Island, and at Amenia, Sharon, etc., on the line of the New York and Harlem Railroad; (4) siderite, mined at Hyde Park on the Hudson. New York is surpassed in the quantity of iron produced by Michigan and Pennsylvania only.

The quarries of New York are numerous, and they furnish a great variety of products: granite in the Adirondacks and along the Hudson; roofing-slate in Washington county; white marble in Westchester and St. Lawrence counties; red marble at Warwick, Orange county; black marble at Glens Falls; verde antique at Moriah and Thurman. Sandstone comes from Potsdam, Medina, and various other localities; shell-limestone from Lockport and Hudson; excellent flagging from Kingston on the Hudson; and paving-stone from the trap of the Palisades. A large amount of hydraulic cement is supplied from the quarries at Rondout (Ulster county), Manlius (Onondaga county), and Akron, near Buffalo; also gypsum from the vicinity of Syracuse.

The deposits of these substances are very extensive, and their production could be increased indefinitely. Another item of importance among the mineral resources of the State is the salt produced from the salt-wells at Syracuse; these have been worked for many years. In southwestern New York gas and oil springs are numerous, and at Fredonia the gas has been used in lighting houses for half a century. Recent discoveries show that the petroleum fields of Pennsylvania extend into New York, and it is probable that petroleum will soon claim a place among the mineral products of the State.

The first European discoverers and explorers found the eastern slope of the continent under the domination of the Iroquois tribes. John Smith met with them on the north waters of Chesapeake Bay in 1607, and Hudson found them in 1609 on the banks of the river to which he gave his name. The chief seat of this powerful nation, whose sway was recognized from the St. Lawrence to the Tennessee and from the Atlantic to the Mississippi, was in the wide and fertile region of western and northern New York. They organized the political league or confederacy known as the Five Nations. These were the tribes of Mohawks, Onondagas, Cayugas, Senecas, and Oneidas. They took the name of "Konoshioni," or People of the Long House, by which they designated the territory occupied by them, extending west from the Hudson at Albany to the foot of the great lakes, a distance of about 325 miles. There is a tradition in one of the tribes that the confederation was formed four years before Hudson's arrival, which would fix the date at 1605. In 1609 Champlain, while accompanying a war party of Hurons and Algonquins on an expedition against the Iroquois, fell in with the enemy on the lake to which he gave his name. European firearms, with which the Iroquois then made first acquaintance, turned the scale of victory against them. The interference of the French aroused in the formidable confederacy a spirit of enmity which, relentlessly nourished, finally arrested the progress of French colonization and French power in Canada, and later secured the triumph of the English arms. The confederacy was at the height of its power about the year 1700. In 1715 they were joined by the Tuscaroras, driven out from North Carolina, and were afterward known as the Six Nations. Until the conquest of Canada by the English in 1763 they were in constant struggle with their French neighbors. The American Revolution proved fatal to them. In 1779 their towns were burned, their orchards and stores of grain destroyed. At this time their civilization was at its height, their houses were of frame, some of elegant construction, their gardens, orchards, and farm-lands extensive and abundantly supplied with fruit. From this terrible calamity they never recovered. Their numbers have been estimated as 25,000 in 1650, and in 1750 about half that number, of whom about 2,500 were fighting-men. Disregarded in the treaty of 1783, their political existence terminated, and their lands were ceded to the State with some small reservations. The last official State census reports the total number of Indians in the State at 5,257, chiefly the remains of the Iroquois tribes. Of these 4,711, in 1900, were living on reservations.

At what time, and by whom, the Bay of New York was first visited by European voyagers is still in doubt. Verrazano is claimed to have entered it with the *Dauphine* in 1524, and Gomez to have sailed along the coast to the latitude of New York in 1525. Of the voyage of Henry Hudson (see HUDSON) there is no doubt. Hudson's report of the picturesque grandeur of the fine harbor and river, of the fertile country on its shores, of the kindly disposition of the Indians, and of the abundance of fur-bearing animals in the interior caused great ex-

citement in Holland; and the United Netherlands, whose independence had been acknowledged in the spring, asserted their claim to the newly discovered country. On the expiration of the charter of the United Netherland Company (October, 1618) a renewal was refused by the states-general, but private ventures were authorized. The exploration of the coast and rivers was actively continued, but special charters to the discoverers were persistently refused. On June 3, 1621, the states-general granted to the West India Company a charter with full powers over New Netherland for a period of twenty-four years. The territory was formally erected into a province, and the management of its affairs assigned to the chamber of Amsterdam. In the year 1622 they sent out trading-vessels and took formal possession of the country. Manhattan Island was purchased of the Indians for the West India Company, and a fort was built which was named Fort Amsterdam. The little colony was annoyed by the encroachments of the English of the New Plymouth colony, and disturbed by the hostilities between the Indian tribes in their immediate neighborhood. The Swedes now began aggressions on the southern border of the Dutch province. In 1664 the colony fell an easy conquest to the English. The population of the province was now fully 10,000, that of New Amsterdam 1,500 persons.

The English government was hostile to any other occupation of the New World than its own. In 1621 James I. claimed sovereignty over New Netherland by right of "occupancy." In 1632 Charles I. reasserted the English title of "first discovery, occupation, and possession." In 1654 Cromwell ordered an expedition for its conquest, and the New England colonies had engaged their support. The treaty with Holland arrested these operations, and recognized the title of the Dutch. In 1664 Charles II. resolved upon a conquest of New Netherland. A patent was issued to the duke of York granting to him all the lands and rivers from the west side of the Connecticut river to the east side of Delaware Bay. The duke's authority was proclaimed, and New Netherland became New York. The name of Fort Orange was changed to Fort Albany, after the second title of the duke. Religious liberty was as large as in England. In 1673 (August 7), war being declared between England and Holland, a Dutch squadron surprised New York, captured the city, and restored the Dutch authority and the names of New Netherland and New Amsterdam. But in July, 1674, a treaty of peace restored New York to English rule. By the accession of the duke of York to the English throne in 1685 the duchy of New York became a royal province. The charters of the New England colonies were revoked, and together with New York and New Jersey they were consolidated into the dominion of New England. Dongan was recalled, Sir Edmund Andros, who suggested the policy, was commissioned governor-general. He assumed his viceregal authority at New York, August 11, 1688. The English Revolution of 1688 had its faint counterpart in the colonies in an insurrection of the militia, headed by one Jacob Leisler, which was not terminated till the arrival from England in 1691 of a new governor, Sloughter, with whose administration what may be called the second period of English rule begins.

The assembly which James had abolished in 1686 was established, and in May declared the rights and privileges of the people, reaffirming the principles of the repealed charter of liberties of October 30, 1683; but religious liberty was curtailed and the Test Act put in force as to Roman Catholics. The government was to be ruled as a province by a governor and council—the

governor having power to institute courts, appoint judges, disburse the revenues, veto all laws, and prorogue or dissolve the assembly at pleasure. The provincial legal authorities protested at once against this access of prerogative. Thenceforth the political history of the province records one continued struggle between the royal governors and the general assembly—the assembly withholding money grants, and the governors exercising the power to dissolve it at will. The chief concern of the province was the defense of the northern frontier. The quartering of British troops became a constant irritation between the people and the officers, and the need of money by the authorities caused as severe a struggle between the governors and the assembly. The conquest of Canada in 1763 closed the long contest in which New York troops were constantly engaged. A general congress of the colonies held in New York in 1765 protested against the Stamp Act and other oppressive ordinances, and they were in part repealed.

On the breaking out of hostilities, New York immediately joined the patriot cause; the English authority was overthrown, and the government passed to a Provincial Congress. In May, 1775, Forts Ticonderoga and Crown Point, which commanded Lakes Champlain and George, and secured the northern frontier, were captured by the Americans. New York city became the headquarters of the continental army under command of General Washington. On July 9, 1776, the Provincial Congress reassembled at White Plains, and formally took the name of the representatives of the State of New York. The same day they proclaimed their adhesion to the Declaration of Independence. The defeat of the Americans on Long Island, August 27, 1776, was followed by the abandonment of the city, September 15th, the army of Washington retiring to the high ground at the northern end of the island. Next day a conflict took place between the advanced troops where Manhattanville now stands. The movement of Howe to White Plains, and his subsequent successful operations, compelled the withdrawal of the Americans to New Jersey. In 1777 the advance of Burgoyne from Canada was checked at Saratoga and his entire army captured; a diversion attempted by St. Leger by way of the Mohawk was likewise unsuccessful. An attempt of Clinton to aid Burgoyne, in which he captured the forts at the entrance to the Hudson Highlands, failed; West Point continued to command the passage of this important line of communication. On April 20, 1777, the State assembly adopted the first constitution. Gen. George Clinton was elected governor, and held the office till the close of the war. In 1779 (July 16th) Stony Point was captured by the Americans. In 1780 the failure of Arnold's treason put an end to the schemes of the British to command the river. The only other action of importance on the soil of the State was the punishment of the Indians who had aided Sir John Johnson in his incursions. Sullivan with 3,000 men penetrated to the heart of the Seneca country and destroyed the towns. In the summer of 1781 Rochambeau with French troops made a junction with Washington in Westchester county, and New York city was threatened by the allied forces. News of the approach of the fleet of De Grasse to Chesapeake Bay caused a transfer to Virginia of the military operations. On the conclusion of the war New York was evacuated, November 25, 1783. Freed from armed occupation, and its seaport regained, the State made rapid progress. Its natural advantages, which the war disclosed, attracted settlers from other States, and the western lands were quickly taken up. In 1788 (July 26th) New York adopted the Federal constitution, became the most important member of the National Union, and received

popularly the name of the Empire State. The seat of government was transferred from New York city to Albany in 1797. The progress of the State met with no interruption until the war with Great Britain in 1812, when its northern frontier became the seat of operations by land and water. The treaty of Ghent put an end to the war, and important schemes for the development of the internal navigation to bring the products of the State to tidal water were rapidly consummated. Steamboat navigation began on the Hudson in 1807, and the canal system was perfected in 1825 in the completion of the Erie Canal, which opened the country from the lakes to the sea. This important artery of commerce has been recently freed from toll by popular vote. The railroad system is still more perfect; great lines traverse the State from its eastern to its western extremity, and a network of minor lines connects every town and village of any importance in the State with the central arteries.

At the close of the Dutch period the settlement of that part of New Netherland which afterward became New York was confined to Manhattan, Long, and Staten Islands, and the banks of the Hudson. Westward of these there were small trading stations on the line of the Mohawk and other water carriages. Early in the last century the admirable natural channel of communication which by the Mohawk river and Wood Creek connects the Hudson with the great lakes attracted immigration. The fertile valley of the Mohawk was the first occupied. After the war settlements spread with rapidity. The State of New York ceding to Massachusetts about 10,000 square miles of territory, there was, before 1800, a large immigration from New England, which extended itself over the interior of the State to its western boundary. This was essentially an agricultural population. The military lands set apart as bounties during the war, to the amount of 180,000 acres, were rapidly taken up by the immigrants who flowed into the western country like a torrent, opening roads and founding villages and towns. Between 1784 and 1800 two cities, three large villages, and numerous smaller settlements were founded, and the population of the State doubled in numbers. The foreign immigration of the last forty years has chiefly settled on the lines of the great railroads, which present an almost unbroken chain of industrial cities.

The fundamental constitution of the State, adopted in 1777, was in its main features after the English model—a chief executive and two separate legislative chambers; justice administered through local county courts, a probate judiciary, a high common-law tribunal called the supreme court, side by side with a court of chancery; final appellate jurisdiction in law and equity vested in the State senate. Religious liberty to all was absolutely secured. In 1821 a new convention greatly simplified the machinery of administration. Under this new constitution the people took to themselves a large part of the powers before delegated to the assembly. The elective franchise was extended by a removal of freehold qualification. In 1846 a new constitution made radical changes in the framework of government. The elective franchise was further extended by diminution of residence qualification; elective districts were established on the basis of population, and shifted with the varying censuses. The elective principle, before confined to part of the executive and legislative officers, was applied also to the judiciary. The separation of the legal and political departments of government was complete. The question was again submitted to the people in 1873, and the election of the judiciary maintained by a large majority. Some slight amendments have been since made. The constitution, as finally matured, completely carries out the principle of a

government of the people by its own directly chosen agencies. Elective restrictions upon negroes and mulattoes were removed by degrees. Slavery was gradually abolished under an act passed in 1799. In 1811 the only discrimination was the requirement of a certificate of freedom. The constitution of 1821 imposed both a residence and a freehold qualification, restrictions which remained until removed in 1870 by the fifteenth amendment to the Federal constitution, when suffrage to males became absolutely free in the State. Married women were secured in their separate rights to real and personal property by statute in 1848. Imprisonment of witnesses was put an end to by act of 1882.

The grant of the West India Company (1629) to the planters of New Netherland required the establishment of a school, and, in 1644, the burgomasters of New Amsterdam made a municipal provision for school purposes in the colony; but this proved nominal, and instruction received little attention until after the arrival of Stuyvesant, when an academy and classical school was established (1659). At the conquest, in 1664, the English found this institution in high repute, and in addition three public schools and a number of private Dutch schools in the city alone. The academy or Latin school was continued by the English authorities for a few years, but the Dutch schools received no government contribution. In 1702 a free grammar school was established by act of Assembly. In 1710 a school was founded by Trinity church, and similar provisions by other religious denominations followed. In 1754 King's College (reorganized in 1784 as Columbia) was established by charter. Here many of the men who became distinguished in the annals of the State received their education. Its departments were fully organized when the Revolution put an end to all instruction, and the building became a military hospital. The Legislature of the State, in 1795, granted an appropriation of \$50,000 for five years for common-school purposes. A general school system was organized by commissioners in 1812. District libraries were instituted in 1838, and a State normal school established in 1844. In 1849 a free-school law was enacted, but its unequal operation caused its repeal. In 1867 a free-school law was again enacted. The schools of the State are noted for their efficiency. All the common schools are free, and are supported by the income of a school fund, and by a State, city, and district tax. A superintendent of public instruction has general supervision. School commissioners elected by the people have charge in each district, and there are boards of education in all the cities. The expenses for teachers' salaries for 1900, were \$19,218,802. The total valuation of school property was \$81,768,495, and 34,848 teachers were employed. The number of persons of school age (five to twenty-one years) was 1,569,115; the enrollment in the schools was 1,037,812, and the average daily attendance 857,488. For the year ending August 30, 1900, the total expenditure for education was \$25,686,012.

The public charities were by act of 1867 placed under the charge of a board of State commissioners of public charities, who are paid expenses but receive no salary. The institutions wholly or chiefly maintained by the State are—asylums for the insane, inebriate, deaf and dumb, blind and idiots, and establishments for reform of juvenile delinquents. In the counties, cities, and towns there are public poorhouses and asylums, besides hospitals, dispensaries, and homes in great variety.

Wealth and Taxation.—The aggregate assessed valuation of the wealth of the State was in 1900 \$5,686,921,678, of which amount \$5,122,588,084 was real and \$346,611,861 personal.

Finances.—The fiscal affairs of the State have been managed on correct principles, and its credit has been maintained unimpaired. To this its payment of the interest and principal of its bonds in coin during the temporary suspensions of specie payment which preceded the civil war and the long national suspension which followed its outbreak greatly contributed. The total funded debt of the State September 30, 1900, was \$10,130,660, over \$9,000,000 of which represents the canal debt. The receipts of the State treasury during the fiscal year ending at same period were \$30,800,755, and the payments \$29,626,557.

New York State is one of the most important of the Union with regard to agriculture. The United States Department of Agriculture gave the crops for 1899 as follows:

PRODUCTS.	Quantity.	Acres.	Value.
Indian corn....bushels	20,024,865	658,652	\$ 9,181,791
Wheat	10,412,675	557,736	7,332,597
Rye	2,431,670	177,416	1,393,313
Oats	40,785,900	1,329,753	12,929,092
Barley	2,943,250	111,658	1,402,184
Buckwheat.....	3,815,350	289,862	2,045,737
Potatoes.....	38,060,471	395,640	15,019,135
Tobacco.....pounds	13,958,370	11,307	1,172,236
Hay and forage tons	6,389,496	5,154,965	55,237,446
Orchard fruits.....	.....	437,582	10,542,272

On January 1, 1899, there were in the State 628,438 horses, 1,501,608 milch cows, 1,094,781 other cattle, 984,516 sheep, and 676,639 hogs. The milk, butter, and cheese product of New York is of great value.

On October 1, 1901, the total resources of the banking and savings institutions of the State amounted to the large sum of \$2,545,901,925. The capital and aggregate resources of the State banks in September, 1900, were \$365,838,895; an increase over 1899 of \$26,440,170. As evidence of the prosperous condition of the State banks, it is noted that there has been no reduction in the capital of any of the number during the year, and not a single suspension or failure has occurred in that period. The total amount of interest-bearing deposits was \$765,317,364.07; an increase of \$18,685,900.50. Three new trust companies with a capital of \$1,500,000 were organized during the year. The total capital employed by the trust companies operating under the State laws shows an increase of \$3,498,000 in the same period. At the close of the fiscal year there were seventeen safe-deposit companies in operation, with an aggregate capital of \$3,123,900.

New York is the first manufacturing State in the Union, and in the last decade the value produced has increased nearly 35 per cent. In 1900, there were in the State 78,658 establishments, employing a capital of \$1,651,210,220 and 923,536 hands. The amount paid in wages was \$500,931,300; for materials, \$1,143,791,776. The products were valued at \$2,175,726,900.

The vessels of all classes built in the State during the fiscal year ending June 30, 1882, numbered 1,371, aggregating 282,269 tons. Of these there were 668 sailing-vessels of 118,798 tons, 502 steamers of 121,942 tons, 68 canal-boats, and 135 barges.

The chief fishing industry is the taking of menhaden, in value (1880) \$1,114,158, and the raising of oysters, value in 1880 \$1,577,050; other fisheries, \$1,689,357. The total number of hands employed in all branches was 7,266, the amount of capital \$2,629,585, and of product, \$4,380,565; the number of vessels employed was 541, measuring 11,583 tons, valued at \$777,600.

New York, owing to its magnificent seaport and its

admirable land and water communication, enjoys a large proportion of the national trade.

On June 30, 1900, there were in the State 8,230 miles of railroad, with gross earnings of \$247,087,779 and net earnings of \$150,517,643. In 1888 there were 4,942,948 tons of freight carried over the Erie canal. The aggregate assets of fire and marine insurance companies doing business within the State in 1888 was \$163,041,841.

New York has the largest population of any of the United States. The census of 1890 gave it 5,997,853, and that of 1900 showed that it had increased to 7,268,012. New York city is the largest, Brooklyn next, and there are thirty large cities in the State, all of which are treated under their respective titles.

NEW YORK, the most important and populous city of the Western Hemisphere, is situated on New York bay, at the junction of the Hudson or North river with a strait known as the East river, leading to Long Island sound. Latitude of city hall, $40^{\circ} 42' 43''$ N.; longitude, $74^{\circ} 0' 03''$ W. of Greenwich. Distance, in straight line from the Atlantic ocean, 18 miles; from Chicago, 900 miles; from Washington, 228 miles; from Boston, 217 miles; from Albany, 142 miles. The territory of the city comprises the whole of Manhattan island, or New York county; so much of Westchester county as lies between the city of Yonkers, the Bronx river, the East river, the Harlem river, Spuytenuyvill creek, and the North river; Blackwell's, Ward's, and Randall's islands in the East river, and Governor's, Ellis's, and Bedloe's islands in New York bay. The portion of the city lying in Westchester county is known as the "Annexed District," and is but sparsely settled. The islands in the East river are occupied by various public charitable and correctional institutions, and those in the bay are under control of the United States Government, their connection with New York being political only. The total area of the city is $41\frac{1}{2}$ square miles; its length, from north to south, 16 miles, and its greatest width $4\frac{1}{2}$ miles. The area of Manhattan Island is 22 square miles, or about 14,000 acres; its length $13\frac{1}{2}$ miles, and its greatest width, at 14th street, $2\frac{1}{4}$ miles. Below the city extends the magnificent bay, forming an irregular oval about 8 by 5 miles. From this a strait, known as "The Narrows," separating Long Island from Staten Island, gives access to the lower bay, from which, in turn, several channels lead past Sandy Hook and Coney island to the open sea. The harbor is accessible at low tide by ships drawing thirty-two feet of water.

The older portion of the city on Manhattan island, below Houston street on the east side, and 14th street on the west, is somewhat irregularly laid out; but the more modern portion as far north as the Annexed District, is arranged upon a plan whose foundation is a system of streets, designated by numbers, extending from the North river to the East river, and crossed at right angles by numbered and lettered avenues. The streets are divided into "east" and "west" by Fifth avenue, and the house numbers begin a new hundred at the corner of each numbered or lettered avenue; thus, No. 200 West Twenty-sixth street will be found on the corner of Seventh avenue, No. 300 East 19th street on the corner of Second avenue, and so on. There are a few exceptions to this system. These are: Broadway (styled the Boulevard above the lower end of Central Park), Madison avenue, extending northward from East 23d street; Lexington avenue, extending northward from East 21st street; St. Nicholas avenue, with its extension, the Kings Bridge road; and a few other streets in the northern part of the city.

The peculiar topography of New York—the most im-

portant portion of the city being located on a long and narrow island, restricting the spread of settlement, within the city limits, to a single direction—has resulted in an extraordinary density of population (in one part of the city nearly 200,000 to the square mile), and has also favored the development of an immense system of neighboring cities and suburbs, whose inhabitants visit New York daily for the transaction of their business. The commercial center of the town, originally at the lower end of Manhattan island, moves steadily northward year by year as trade increases, pushing the residence district before it. The problem of rapid transit between the northern and southern portions of the city is thus one of pressing and overwhelming importance. It has been solved, for the present, by the construction of the elevated roads. Short distance travel about the city is accommodated by numerous surface railways, operated by horses, cables, and electricity. The uniform rate of fare is 5 cents.

With the sister city of Brooklyn, New York is connected by an extensive system of ferries, and by the East River, or Brooklyn Bridge. Ferries are maintained from Catharine street, New York, to Main street, Brooklyn; Fulton street, New York, to Fulton street, Brooklyn; Whitehall street to Atlantic street; Whitehall street to Hamilton avenue; Wall street to Montague street; Whitehall street to 39th street; Roosevelt street to Broadway; Houston street to Grand street; Grand street to Broadway; Grand street to Grand street; and East 23rd street to Broadway. Ferries to the suburbs of Brooklyn are run as follows: East 10th street and East 23rd street to Greenpoint; James Slip and East 34th street to Hunter's Point; and East 92d street to Astoria. Most of these ferries are run at frequent intervals throughout the twenty-four hours; the boats are well equipped and capacious. The ferry franchises are the property of the city of New York, and are rented to the corporations operating the ferries by public auction at stated periods.

The Brooklyn or East river suspension bridge is one of the engineering triumphs of the age. Starting from a point on Chatham street, opposite the city hall park, New York, it extends to the square bounded by Fulton, Prospect, Sands, and Washington streets, Brooklyn, a total length of 5,989 feet. The bridge consists of a central span, from shore to shore, of $1,595\frac{1}{2}$ feet; shore spans, from the towers to the cable anchorages, each, 930 feet long; a viaduct approach of masonry on the New York side, $1,562\frac{1}{2}$ feet; and a similar approach on the Brooklyn side, 971 feet. The suspension bridge proper is supported by two granite towers, over which the cables are passed and secured to heavy anchorage plates, set in solid masonry. The towers rest on caissons, sunk to bed-rock below the river, and solidly filled with concrete. The bridge is eighty-five feet wide, including a roadway on each side for vehicles, a central promenade, thirteen feet wide, for foot passengers, and two railway tracks, on which trains are run at intervals of a few minutes, the traction power being furnished by a stationary engine at the Brooklyn terminus, through an endless cable. The yearly travel amounts to over 3,000,000 foot passengers; nearly 40,000,000 railway passengers, and an immense number of vehicles. The toll for foot passengers is 1 cent; railway fare, 3 cents; but tickets are sold in packages at the rate of $2\frac{1}{2}$ cents by rail; and $\frac{1}{2}$ of a cent for pedestrians. The construction of the bridge was begun January 2, 1870, and the structure was opened for travel May 24, 1883. The cost of building exceeded \$20,000,000. The bridge is the joint property of the cities of New York and Brooklyn. Height of main span above high-water mark, $135\frac{1}{2}$ feet; height of towers above high-water mark, $271\frac{1}{2}$

feet; depth of tower foundations below high-water mark, New York side, 78½ feet; Brooklyn side, 44½ feet; number of cables, 4; diameter of each cable, 15¾ inches; length of each cable, 3,578½ feet; number of wires in each cable, 5,434; weight of wire, about 1 pound to 11 feet; weight of 4 cables, 3,588½ tons; sustaining strength of each cable, 12,200 tons; estimated strain on each cable when bridge is used to fullest capacity, 3,000 tons; weight of entire suspended structure, 6,740 tons; height of roadway at towers, 119 feet; height of arches above roadway, 117 feet; height of towers above roadway, 159 feet; size of towers at top, 53 x 136 feet; width of openings through towers, 33 feet 9 inches; cubic yards of masonry in towers—New York, 46,945; Brooklyn, 38,214. A special police force patrols the bridge at all hours for the purpose of preserving order, stopping runaways, etc. The executive *personnel* consists of six chiefs, thirty-one collectors, seventeen gatemen, ninety conductors, and ninety-one policemen, all under control of the board of trustees.

With the sub-metropolitan cities on the New Jersey side of North river, New York is connected by ferries operated by the various lines of railway terminating on the New Jersey shore. These are: from Desbrosses street and from Cortlandt street to the Pennsylvania Railway depot in Jersey City; from Liberty street to the New Jersey Central Railway depot in Communipaw; from Chambers street and from West 23d street to the Erie Railway depot in Jersey City; from Barclay street and from Christopher street to the Delaware, Lackawanna and Western Railway depot in Hoboken; from Jay street and from West 42d street to the West Shore Railway depot at Weehawken; and from West 14th street to 14th street, Hoboken. Other ferries connect the city with Fort Lee, Staten Island, and the islands in the bay and East river. Some of the prominent buildings of the city have to-day (1902) a height of 306 feet, with 23 stories.

Geographically New York occupies a situation of unequalled advantage for commercial development. The harbor is one of the most spacious in the world, the bay containing fourteen square miles of anchorage, and the rivers bordering on the city thirteen and a half miles more. On Manhattan Island alone the deep water frontage available for shipping extends twenty-five miles, and the frontage on Long Island, Staten Island, and the New Jersey shore is practically unlimited. The Hudson river and Erie canal form a direct water route to the great lakes; a vast system of railways and coast-wise steamship lines connects the city with all other parts of the continent; numerous lines of steam packets afford frequent and regular intercourse with foreign ports, and a network of telegraph lines and ocean cables gives instantaneous communication with all the other commercial centers of the world. As a result of these advantages New York has become the commercial metropolis of half the world. About 60 per cent. of the entire foreign commerce of the United States passes through her port.

Number and tonnage of vessels belonging to the port of New York, June 30, 1889:

CLASS OF VESSELS.	Number.	Tonnage.
Sailing vessels.....	2,167	422,664.37
Steam vessels.....	1,076	372,896.37
Canal boats.....	208	21,298.34
Barges.....	631	129,455.27
Totals.....	4,082	946,314.35
Total United States.....	23,623	4,307,475.24

Monthly receipts from customs at New York for three years:

MONTHS.	1887.	1888.	1889.
January.....	\$11,792,309.48	\$13,499,155.07	\$14,031,750.27
February.....	13,096,217.48	13,138,231.29	12,954,910.52
March.....	14,200,807.33	11,054,638.21	13,423,093.84
April.....	11,547,111.54	11,159,083.32	11,963,737.03
May.....	10,887,700.40	9,982,059.71	11,097,652.64
June.....	11,827,248.85	10,988,946.36	10,697,750.42
July.....	12,705,045.43	14,159,594.45	13,787,329.06
August.....	15,602,081.70	13,854,742.26	13,324,501.67
September.....	13,825,677.34	12,124,963.96	12,016,108.12
October.....	12,380,656.47	11,969,848.60	12,202,036.15
November.....	10,178,869.86	9,609,828.40	11,176,009.20
December.....	9,777,050.66	10,962,999.20	10,997,985.55
Total.....	\$147,820,776.54	\$142,504,090.92	\$147,672,865.31

Imports of leading articles into the port of New York, for fiscal year ending June 30, 1889, as compared with all other ports in the United States for same period:

ARTICLES.	Value.	Port of New York.	All Other Ports.	Totals.
Sugar, lbs.	1,463,051,343	\$42,943,453		
Molasses, gals.	8,408,875	1,424,251	\$44,367,704	\$48,930,164
Coffee, lbs.	455,979,016	58,860,319	15,864,563	74,724,882
Tea lbs.	58,476,531	9,643,514	3,011,126	12,654,640
Manufactures of wool		41,048,679	11,516,263	52,564,942
Manufactures of silk,		31,120,113	3,993,653	35,122,766
Manufactures of cotton,		20,599,285	6,206,657	26,805,942
Manufactures of flax,		18,457,806	7,247,747	25,705,553
Hides and skins, other than furs,		17,562,461	7,565,289	25,127,750
Tin (bars, blocks and pigs,) lbs.	30,662,815	6,351,993		
Tin plates, lbs.	296,616,337	8,473,505	14,825,588	13,411,560
India rubber & gutta percha, crude, lbs.	28,952,361	11,094,063	1,293,068	12,387,131
Leather, all kinds	3,542,859			
Manufactures of leather,	4,654,840	8,197,699	3,098,623	11,296,322
Tobacco, leaf, lbs.	14,766,244	8,207,085		
Manufactured Precious stones	1,850,798	10,147,883	4,463,107	14,610,990
Raw silk, lbs.	1,984,797	9,498,209	1,273,424	10,771,633
Wool, lbs.	53,520,892	7,408,647	11,135,378	18,544,025
Wines,	6,156,821	6,540,930	11,433,585	17,974,515
Hemp, tons,	37,755	6,394,451	1,549,951	7,706,772
Sisal grass, etc., tons, 20,181	4,437,105			
Jute, tons,	82,327	2,509,659	13,431,215	4,966,531
Furs, dressed on skins, and manufactured		4,748,971	579,085	5,328,056
Earthen, stone and china ware		3,236,780	3,245,519	6,476,299

Total value of leading articles of foreign merchandise	\$336,949,687	\$160,785,293	\$497,734,980
Total value of all other articles of foreign merchandise	135,203,820	112,192,852	247,396,672
Total value of coin and bullion	7,274,618	21,688,455	28,963,073
Total foreign imports, 1888-89	\$479,428,125	\$294,666,600	\$774,094,725

Exports of leading articles of domestic merchandise from the port of New York for fiscal year ending June 30, 1889, as compared with all other ports in the United States for same period:

ARTICLES.	Port of New York.	All Other Ports.	Totals.
Cotton, bales, 1,118,981; lbs. 536,614,048	\$54,701,315	\$183,073,955	\$237,775,270
BREADSTUFFS. Value.			
Wheat, bush. 9,086,407	\$8,449,510		
Flour, bbls. 3,335,195	15,498,193		
Corn, bush. 26,658,970	13,066,961		
All other breadstuffs 1,765,287			

PROVISIONS.

Beef, canned, lbs. 22,515,849	\$1,826,998		
Beef, fresh, lbs. 89,039,739	7,786,514		
Beef, salted or pickled 33,332,691	1,865,625		
Tallow, lbs. 51,074,039	2,640,118		
Bacon, lbs. 190,648,577	16,218,948		
Hams, lbs. 21,559,524	2,577,151		
Pork (pickled), lbs. 34,841,468	2,650,100		
Lard, lbs. 201,068,330	16,964,676		
Oil, lbs. 28,102,534	2,664,492		
Butter, lbs. 12,015,962	1,971,634		
Cheese, lbs. 68,809,093	6,298,337		
All other pro- visions 1,039,832			

MINERAL OILS.

Illuminating, gals. 354,378,595	\$28,083,946		
Lubricating, gals. 22,305,022	3,949,235		
Crude, gals. 42,089,455	3,070,941		
All other mineral oils, 954,834			

TOBACCO.

Leaf, lbs. 138,957,318	\$11,957,035		
Manufactured, 3,334,049			
Manufactures of Cotton, Cattle, number, 75,004	15,291,044	6,964,507	22,255,501
Leather, sole, lbs. 29,901,277	6,204,624	10,412,293	16,616,917
Oil cake and oil cake meal, lbs. 231,034,283	4,906,214	984,295	5,890,509
Furs and fur skins.....	3,032,066	3,895,846	6,927,912
	4,724,017	310,418	5,034,435
Total, leading articles of domestic merchandise	\$235,922,049	\$346,704,011	\$582,626,060
Total, all other exports, domestic merchandise	75,006,102	72,650,447	147,656,549
Total domestic coin and bullion.....	69,724,274	10,490,720	80,214,994

The total exports of New York, for 1901, were in value \$529,592,978; the total imports, \$527,259,946.

Foreign exports from New York for twenty years, ending December 31st:

Year.	Domestic Products.	Foreign Products.	Specie and Bullion.	Total Exports.
1870.....	\$185,740,061	\$10,205,672	\$58,191,475	\$254,137,208
1871.....	225,553,247	9,112,990	63,865,546	298,531,783
1872.....	225,475,687	11,383,610	71,959,042	308,818,339
1873.....	288,707,357	11,538,048	48,659,661	348,905,066
1874.....	274,201,898	9,738,235	61,222,228	345,162,361
1875.....	247,681,724	8,780,444	67,556,650	324,018,818
1876.....	265,774,302	9,776,662	43,097,102	318,648,066
1877.....	290,960,048	7,973,923	27,497,169	326,431,140
1878.....	349,206,868	9,207,432	13,107,788	362,522,088
1879.....	349,471,680	6,746,885	14,828,044	371,046,609
1880.....	406,955,884	8,866,943	9,370,272	425,193,099
1881.....	358,479,334	14,656,536	12,623,831	385,760,201
1882.....	334,190,006	12,289,577	48,013,279	394,501,862
1883.....	337,093,193	12,349,233	19,390,005	368,832,431
1884.....	321,400,682	9,460,694	54,410,573	385,271,949
1885.....	321,149,580	9,669,113	24,641,266	355,459,959
1886.....	308,187,092	9,984,519	50,024,339	368,195,950
1887.....	304,021,758	8,998,923	21,046,701	334,067,382
1888.....	299,779,611	9,111,569	49,565,852	349,450,582
1889.....	339,785,436	9,074,152	71,685,395	417,545,010

Foreign imports into New York for twenty years, ending December 31st:

Year.	Dutiable Goods.	Free Goods.	Specie and Bullion.	Total Foreign Imports.
1870	\$289,618,878	\$13,716,500	\$11,864,644	\$315,200,022
1871	349,635,398	28,878,294	6,348,608	384,862,300
1872	369,083,458	57,429,020	5,594,208	432,106,686
1873	293,035,348	86,924,877	18,605,611	398,565,836
1874	278,677,532	108,598,631	6,407,571	393,683,734
1875	235,398,509	91,791,853	13,438,557	340,628,919
1876	202,486,773	76,659,977	26,217,888	305,364,638
1877	221,401,649	62,686,992	15,000,227	329,088,868
1878	201,540,213	82,495,681	19,150,973	303,186,867
1879	234,775,206	105,217,808	84,196,109	424,189,123
1880	337,250,149	126,926,531	75,210,096	539,386,776
1881	310,103,977	129,297,696	56,023,233	495,424,906
1882	359,357,163	132,876,823	7,694,788	499,928,774
1883	325,199,510	127,485,979	20,174,396	472,859,885
1884	287,105,930	126,591,112	27,010,641	440,707,683
1885	264,142,862	119,397,594	17,701,094	401,241,550
1886	298,234,553	134,846,667	47,089,519	472,089,739
1887	310,398,405	151,136,190	40,575,963	502,110,558
1888	301,008,039	154,865,981	8,206,393	464,080,323
1889	329,210,894	163,820,087	7,948,166	500,979,147

Classification of foreign imports at New York for three years, ending December 31st:

Year.	Dry Goods.	General Merchandise.	Specie and Bullion.	Total.
1887	\$121,743,445	\$339,791,150	\$40,575,963	\$502,110,558
1888	125,876,999	329,997,021	8,206,393	464,080,323
1889	136,692,868	356,338,113	7,948,166	500,979,147

Statistics of population of New York City:

Years.	Population.	Years.	Population.
1656	1,000	1820	123,706
1664	1,500	1825	166,086
1668	4,937	1830	202,589
1731	8,622	1835	268,089
1756	13,046	1840	312,710
1771	21,862	1845	371,223
1786	23,614	1850	515,547
1790	33,131	1855	620,810
1800	60,489	1860	805,658
1805	75,770	1865	726,386
1810	96,373	1870	942,292
1816	98,634	1880	1,206,299

The census returns place the present resident population of New York in 1890 at 1,515,301, and the population of Greater New York in 1900 at 3,437,202.

Statistics of manufacturing in New York City, 1900:

PRINCIPAL INDUSTRIES.	No. of Estab-lishments.	Capital.	Yearly Value of Products.	Total Value of Product in entire U. S.
Artific'l fth'rs and flowers	152	\$ 2,964,748	\$ 4,997,194	.....
Book binding	239	4,383,901	7,619,155	.....
Boots & shoes.	99	4,154,981	9,124,495	\$261,028,580
Bread & bakery products	1,966	13,798,593	32,230,307	.....
Carpentering	1,491	7,915,870	26,061,584	.....
Carriages and wagons	236	3,627,751	4,317,872	121,537,276
Chemicals.	37	4,437,028	5,266,656	202,582,396
Cloth'g, men's	1,889	36,842,799	103,220,201	276,861,607
" women's	1,607	27,383,909	102,711,604	159,339,539
Confectionery	530	6,516,643	14,483,900	.....
Druggists' prep	34	3,786,065	6,014,762	.....
Electrical apparatus, sup.	104	8,781,700	10,851,350	.....
Flour & grist mill products	11	8,230,518	8,813,487	560,719,063
Foundries and mach' shops	589	48,092,891	41,089,475	835,759,034
Fur goods.	512	6,917,625	15,238,840	.....
Furnishing goods, men's	223	7,675,454	18,716,313	.....
Furniture	187	7,274,874	13,246,405	.....
Gas, illum. and heating	13	134,177,693	17,116,089	75,716,693
Hats and caps.	256	2,474,510	7,932,431	.....
Jewelry	229	5,454,165	9,712,179	.....
Leather goods	113	2,685,149	6,119,864	204,038,127
Liquors, malt	89	65,585,624	39,105,837	340,615,466
Lumber prod.	133	6,201,879	9,761,061	566,832,984
Masonry, brick and stone	383	9,891,268	43,353,473	.....
Millinery and lace goods.	383	7,692,055	20,983,956	.....
Musical instru-ments	95	11,371,771	12,650,905	44,514,463
Painti'g, house etc.	1,688	3,958,615	13,978,421	.....
Paints	61	10,354,097	11,407,160	.....
Patent med's	180	7,256,270	9,792,820	.....
Plumbing	1,608	5,967,588	21,194,749	.....
Printing, b'k. and job	996	19,107,954	26,484,933	121,799,096
Printing, news-papers and periodicals	413	40,866,549	51,397,304	222,983,569
Shipbuilding	90	1,673,298	6,132,119	74,578,158
Shirts	216	4,689,730	14,212,181	.....
Silk & silk g'ds	68	7,073,106	9,521,354	107,256,258
Slaughter in g. wholesale	30	7,709,958	34,923,412	87,355,885
Soap & candles	50	4,054,753	7,729,792	.....
Sugar refining	12	62,423,250	88,598,113	.....
Tobacco, chew-ing	13	1,134,692	3,829,313	103,754,362
Tobacco, cig'rs & cigarettes	1,841	15,669,371	37,998,261	160,223,152
All industries.	39,776	\$921,876,081	\$1,371,358,468	.....

Statistics of savings banks of New York City (Manhattan and Bronx) for twenty years:

DATE.	No. of Banks.	Amt. of Deposits.	No. of Depositors.	Average due each Depositor.
Jan. 1, 1881	25	\$193,235,538	504,921	\$382.70
" 1882	25	211,148,385	549,081	384.55
" 1883	25	225,522,914	580,333	388.61
" 1884	25	237,778,355	607,804	391.15
" 1885	25	244,425,371	618,088	395.45
" 1886	24	255,946,181	640,524	399.59
" 1887	24	270,569,389	669,556	404.10
" 1888	24	283,350,552	699,510	405.07
" 1890	25	307,773,288	745,353	412.90
" 1900	26	525,286,399	1,077,832	487.35

Assessed valuation of real and personal estate in New York City, 1874 to 1900, both inclusive:

YEARS.	Value of Real Estate.	Value of Per-sonal Estate.	Total.
1874.....	\$881,547,995	\$272,481,181	\$1,154,029,176
1875.....	883,643,545	217,300,154	1,100,943,699
1876.....	892,428,105	218,626,176	1,111,054,283
1877.....	895,063,933	206,028,160	1,101,092,093
1878.....	900,855,700	197,532,075	1,098,387,775
1879.....	918,134,380	175,934,955	1,094,069,335
1880.....	942,571,600	201,194,037	1,143,765,727
1881.....	976,571,109	209,218,899	1,185,948,008
1882.....	1,035,203,816	198,278,582	1,233,476,398
1883.....	1,079,130,669	197,516,495	1,276,677,104
1884.....	1,119,761,597	218,536,746	1,338,298,343
1885.....	1,168,443,137	202,073,866	1,371,117,003
1886.....	1,203,941,065	217,027,221	1,420,968,286
1887.....	1,254,491,849	253,148,824	1,507,640,663
1888.....	1,302,818,879	250,023,552	1,553,442,431
1900.....	3,068,457,900	585,556,493	3,654,122,193

Number and nationalities of alien immigrants arriving at the port of New York during five years ending June 30th:

FROM	1885.	1886.	1887.	1888.	1889
UNITED KINGDOM;					
England.....	33,834	35,879	52,970	56,620	50,535
Ireland.....	36,525	34,357	40,866	48,796	45,282
Scotland.....	6,279	8,683	13,990	17,413	13,016
Wales.....	985	899	1,593	1,177	750
Great Britain.....	27	9	4	5	12
Total United Kingdom	77,650	79,827	115,423	124,011	109,596
CONTINENTAL EUROPE;					
Austria.....	10,977	10,416	18,316	23,533	17,690
Bohemia.....	5,817	3,849	2,716	2,204	1,774
Hungary.....	9,059	12,134	14,124	14,773	10,341
Belgium.....	1,482	1,254	2,219	2,770	2,230
Denmark.....	5,713	5,779	7,497	8,073	7,850
France.....	2,845	2,861	4,321	5,325	4,024
Germany.....	106,856	71,696	76,941	81,481	73,586
Gibraltar.....		7	12	9	13
Greece.....	161	102	310	764	80
Italy.....	12,725	20,472	46,474	49,762	23,272
Sicily.....	43	20	90	483	3
Malta.....	4	7	1	2	....
Netherlands.....	2,596	2,252	4,422	5,681	6,399
Norway.....	9,036	9,730	12,798	14,993	10,948
Portugal.....	26	70	27	9	18
Roumania.....	779	476	2,933	1,139	798
Russia.....	15,814	16,126	24,824	26,824	26,348
Finland.....	381	368	1,022	1,578	1,844
Poland.....	2,370	3,143	4,388	3,972	3,312
Spain.....	261	284	334	386	359
Sweden.....	16,177	20,135	31,681	41,859	29,108
Switzerland.....	5,812	4,710	5,026	7,056	6,986
Turkey in Europe	6	164	200	165	207
Other Countries.	2	....	....	2	....
Total	209,032	186,035	259,776	293,443	228,098
Total Europe	286,682	265,862	375,199	417,454	337,693
ASIA.....	92	64	317	313	449
All other Countries...	449	444	489	656	642

Total arrivals at New York.....	287,223	266,370	376,005	418,423	338,784
Total arrivals in U. S.....	395,346	334,203	490,109	546,889	444,427
Per cent. arrived in New York.....	72.65	79.70	76.72	76.51	76.24

Although a very large proportion of the business of New York, notably in the dry goods, clothing, and similar trades, is transacted in separate stores, and by a system of public auctions, it is probably true that the larger part is done at the various exchanges, where buyers and sellers of securities and commodities meet in person or through their brokers, and prices are fixed by the constant fluctuation of supply and demand. The STOCK EXCHANGE occupies a handsome five-story building of white marble, with a frontage of seventy

feet on Broad street, and 162 feet on New street, with an L running though to Wall street. Membership is limited to 1,100, each "seat" being worth about \$30,000. The recorded daily transactions in stocks, bonds and government securities amount to many millions, while the private unrecorded transactions among the members probably amount to as many more. A "gratuity fund" provides for the payment of \$10,000 to the heirs of every member dying, without any deduction whatever. In case of the death of any member his "seat" is disposed of by the governing committee, and the proceeds applied to payment of any dues or liabilities to the exchange or its members, the balance being handed to his heirs. Members are prohibited from holding seats in any other exchange dealing in stocks and bonds, and from engaging in partnership with other persons holding such seats. The CONSOLIDATED STOCK AND PETROLEUM EXCHANGE is a rapidly rising rival of the Stock Exchange, formed by the consolidation of the American Mining Stock Exchange, the National Petroleum Exchange, the Miscellaneous Security Board, and the New York Petroleum Exchange and Stock Board. It occupies a massive building 91 feet on Broadway, 132 feet on Exchange place, and 87 feet on New street. A feature of this exchange is its clearing system for transactions in securities. The PRODUCE EXCHANGE is claimed to be the largest organization of its kind in the world. Its membership is 3,000; and almost all the large transactions in breadstuffs and provisions are made on its floor. It occupies a magnificent building covering the entire block bounded by Whitehall, Beaver, New, and Stone streets. The COTTON EXCHANGE, founded in 1871, occupies a large building on Hanover square, Beaver street and William street. The COFFEE EXCHANGE, on Pearl and Beaver streets, dates from 1882, and has a membership of over 300. The METAL EXCHANGE, on the corner of Pearl street and Burling slip, has about 400 members. THE MARITIME EXCHANGE, located in the Produce Exchange Building, deals in vessel charters and freightages; one of its features is a reading room equipped with standard works and periodicals relating to shipping interests of every kind. The BUILDING EXCHANGE, No. 12 Dey street, deals in building materials of every kind. The REAL ESTATE EXCHANGE, 57 Liberty street, is devoted to the sale of real estate, chiefly by auction, and within the limits of the city. The MERCANTILE EXCHANGE, corner Harrison and Hudson streets, is an outgrowth of the former Butter and Egg Exchange, and deals in butter, cheese, eggs, and preserved provisions. It has about 800 members.

The incorporated banks of discount and deposit are eighty-eight in number, forty-six being organized as National Banks, and forty-two doing business under state charters. The business centers in the clearing house, composed of sixty-three banks and the assistant treasurer of the United States, to which institution each bank pays daily whatever balance may be due by it in settlement with all other banks, or from which it receives whatever balance may be similarly due to it. Banks, not members of the clearing house, make their clearances through the agency of banks belonging to the association. The total business transacted at the clearing house during 1901 was as follows:

Total exchanges.....	\$77,020,672.494
Total balances, paid in money.....	3,515,037.741

The condition of the New York banks, both national and State, as shown by their quarterly statement, December 4, 1889, was as follows:

LIABILITIES.

Capital.....	\$ 65,912,700
Surplus and Net Profits.....	59,428,500
Circulation.....	3,991,500
Due Banks.....	130,720,200
Deposits.....	302,725,500
Sundries.....	206,300
	<hr/>
	\$582,984,700

RESOURCES.

Loans and Discounts.....	\$376,271,900
Stocks.....	38,703,000
Real Estate.....	15,005,800
Due from Banks.....	42,011,700
Cash Items and Bank Notes.....	4,480,200
Specie.....	78,723,700
Legal Tenders.....	27,362,100
Sundries.....	426,300
	<hr/>
	\$582,984,700

The average daily receipts of the forty-eight banks in New York, it is estimated, exceeded (in 1900) \$160,000,000.

The water supply of New York is obtained chiefly from the Croton river, a small stream in Westchester county, about forty miles distant, whence it is brought by aqueduct, crossing the Harlem river on a lofty bridge, and distributed by service pipes throughout the city. The present daily consumption is about 100,000,000 gallons, which compels the use of the aqueduct to its full capacity. A retaining reservoir in Central Park has a capacity of 1,000,000,000 gallons, and storage reservoirs at Croton lake, Boyd's Corners, and the middle branch have capacity for about 10,000,000,000 gallons more, in all about three months' supply. Pumping engines and towers are used to supply the more elevated parts of the city. The yearly cost is about \$1,500,000, which is defrayed by a tax on buildings, supplemented by special charges where water is used for boilers or manufacturing purposes. The system is under control of the department of public works. A new conduit, from 1890 in process of construction, is now completed, being a tunnel through solid rock, at an average depth of 200 feet below the surface, in an almost direct line from Croton lake. This gives a capacity of more than 300,000,000 gallons daily, and is expected to suffice for the wants of the entire city for many years to come.

The hospitals of New York are numerous, and excellently managed. Thirty dispensaries, at central points, provide free medical advice and remedies. The asylums for orphans, aged and helpless persons, insane, etc., are well supported and managed. Among the prominent benevolent associations are: The Association for the Improved Instruction of Deaf Mutes, where pupils are taught to use articulate sounds; the Catholic Protector, for the care and reformation of vicious children; the Children's Aid Society, which supports several newsboys' lodging houses and other refuges and schools for children; the Five Points House of Industry; the Home for Inebriates; the Leake and Watts Orphan House; the Roman Catholic Orphan Asylum; St. John's Guild, for furnishing health-excursions and seaside visits to the poor; the Sheltering Arms, for homeless children between two and ten years, for whom no other institution provides; the Society to Befriend Working Girls, for sheltering and teaching young women out of work; the United Hebrew Charities of the City of New York, for aiding and relieving the worthy Hebrew poor. Beside these, a very large number of "homes," asylums and institutions for various branches of charity are supported by church congregations or organized private benevolence.

The correctional institutions are the penitentiary, alms-

house and workhouse, on Blackwell's Island, to which criminals convicted in the city courts are sentenced for short terms. The city prison proper, generally called the Tombs, a massive building in Egyptian style, occupies the entire block bounded by Centre, Elm, Leonard and Franklin streets. Minor prisons, for the temporary detention of prisoners awaiting trial, are attached to the several police courts.

The public schools under control of the city comprise forty-five grammar schools for males, forty-seven grammar schools for females, thirteen grammar schools for both sexes, seventy-eight primary departments of grammar schools, thirty-nine separate primary schools, forty-eight industrial schools, reformatories, etc., twenty-nine evening schools, one nautical school, one normal college for training teachers, one training school, and one College of the City of New York. Among the incorporated educational institutions of New York the principal are: Columbia College, embracing schools of arts, mines, law, political science, and medicine; the University of the City of New York, with schools of art and science, law, and medicine; Bellevue Hospital Medical College, College of Pharmacy, College of Dentistry, St. Francis Xavier's College and St. John's College, under control of the Jesuit Fathers; Manhattan College, under control of the Christian Brothers of the Roman Catholic church; Academy of Mount St. Vincent, for girls, under control of Sisters of Charity; Academy of the Sacred Heart, for girls, under control of Ladies of the Sacred Heart; General Theological Seminary of the Protestant Episcopal church; Union Theological Seminary, and art schools of the National Academy of Design. The Cooper Union, founded by the late Peter Cooper, offers free courses to males and females in art, various sciences, wood engraving, stenography, and type-writing.

Although New York may fairly be regarded as the literary center of the United States, its libraries have hitherto been inadequately equipped, but the new amalgamated city library will remove this reproach.

The parks are a feature of New York of which the city is justly proud. Central Park, containing about 840 acres, lies between 59th and 110th streets, and Fifth and Eighth avenues. It is laid out in a system of roads, bridle-paths, and footpaths, with constantly varying landscape effects of thicket, lawn, and rugged rock; the natural features of the locality having been made the groundwork of all subsequent improvements. The carriage ways or drives are about nine miles long; the bridle-paths more than five miles, and the footpaths twenty-eight miles. The numerous bridges are built each from a special design to harmonize with the surroundings. A winding lake, with jutting points and deep bays, is gay with pleasure boats in summer and throngs of skaters in the winter; a broad paved esplanade gives access to it, led up to by a spacious mall or avenue, bordered with noble trees and green-sward, and adorned with numerous statues of historic characters. Small lakes are scattered through the park, and a labyrinthine footpath, known as the Ramble, is crossed by numerous romantic rivulets. Among the notable features of Central Park are the menagerie, the Museum of Natural History, and the Metropolitan Museum of Art, which contains the celebrated Cesnola collection of Cyprus antiquities, and the famous Egyptian obelisk, Cleopatra's Needle. Riverside Park, or more properly Drive, is an attraction such as no other city in the world possesses. It extends along the bluffs skirting the North river from 72nd to 130th street, terminating in a lofty eminence named Claremont, on which is situated the tomb of General Grant, and whence extends a wonderful view of the broad and busy

river stretching to the north. Riverside is fast becoming the fashionable drive, and numerous handsome residences already line its landward side. Morningside Park comprises a narrow strip of land lying at the foot of Bloomingdale Heights, north of Central Park; and although not yet completed, is already very beautiful. It is overlooked by the site on which will stand the new Episcopal cathedral. Mount Morris Park, between 120th and 124th streets, though containing only twenty acres, is one of the most beautiful parks in the city. A rocky peak, over 100 feet high, rises in its center, and winding paths lead to an observatory on its summit. In the annexed district, land has recently been acquired for six new parks: Pelham Bay, containing about 1,700 acres, with a shore line of nine miles on Long Island Sound; Bronx, containing 653 acres, near Williams Bridge, on the northern city line; Van Cortlandt, just south of the city of Yonkers, containing about 1,000 acres; Crotona, St. Mary's, and Claremont, containing respectively 135, 25, and 38 acres. The Battery, the most ancient park in the city, is also one of the most beautiful, though disfigured by the elevated roads which wind along its side. It occupies the extreme southern point of Manhattan Island, and the salt breezes from the bay make it a delightfully cool resort in summer. "Castle Garden," within the limits of the Battery, was until very lately the landing place for all immigrants arriving in New York; but Ellis' Island, in the bay, has now been set apart for that purpose.

Years	Spring of 1890	
1881	16	Dwelling houses costing over \$50,000.
1882	20	
1883	88	Dwelling houses costing over \$20,000.
1884	10	
1885	135	
1886	4	Dwelling houses costing less than \$20,000.
1887	13	
1888	238	
1889	238	
1890	48	
1881	767	Apartment houses costing over \$15,000.
1882	356	
1883	577	
1884	315	
1885	185	Tenement houses costing less than \$15,000.
1886	1,013	
1887	983	
1888	448	
1889	1,174	
1890	1,070	
1881	194	Hotels.
1882	31	
1883	4	
1884	8	Stores costing over \$30,000.
1885	33	
1886	40	
1887	31	
1888	23	Stores costing over \$15,000.
1889	42	
1890	47	
1881	18	Stores costing less than \$15,000.
1882	77	
1883	80	
1884	66	
1885	32	
1886	38	Office buildings.
1887	22	
1888	141	
1889	140	
1890	154	
1881	38	Factories.
1882	116	
1883	137	
1884	133	Schools.
1885	5	
1886	1	
1887	6	Churches.
1888	17	
1889	8	
1890	16	Municipal buildings.
1881	11	
1882	8	
1883	13	
1884	14	
1885	13	
1886	13	
1887	13	
1888	13	
1889	13	
1890	13	
1881	21	Theaters.
1882	130	
1883	130	
1884	85	Stables.
1885	44,793,186	
1886	44,384,338	
1887	41,480,208	
1888	45,374,013	
1889	58,739,733	
1890	67,069,570	
1881	47,560,145	
1882	69,504,872	
1883	19,688,997	Total cost of buildings

The older buildings in New York, except some public edifices, show little architectural beauty; but of late years many very handsome structures have been built, the use of elevators permitting extraordinary height where necessary. The materials employed are of the most various description, granite, brick, marble, Caen stone, native brown stone, iron etc., the designs presenting examples of every style, Greek, Roman, Italian, Renaissance, etc., frequently with daring modifications. The fine Pulitzer building, for the publication rooms of the *New York World*, built of brick, Scotch sandstone, granite, and iron, rises eleven stories to the roof, above which a circular tower, fifty feet in diameter, rises five stories higher, making a total height from the pavement of 311 feet, with a depth below the street level of thirty feet. The buildings of the *Tribune* and *Times* are also noteworthy, the former of brick with stone trimmings, and the latter of granite. The W. S. Barge office at the Battery, the vast Produce Exchange with its tower rising 200 feet, the buildings of the Equitable and Mutual Life Insurance Companies, the City Hall, the Custom House, and most of the magnificent new office buildings in and around Wall street, are all well worth attention. Among the churches, St. Patrick's cathedral on Fifth avenue is the most striking. It is of pure white marble, with base course of granite, built in Gothic style, with towers 330 feet high. Trinity church on Broadway, fronting Wall street, is a stately Gothic edifice of brown stone, with steeple rising 284 feet. St. Paul's chapel on Broadway and Vesey street, and St. John's on Laight street, are beautiful specimens of colonial architecture.

History.—The first settlement on Manhattan Island was made in 1613, when Captain Hendrik Christiaensen, representing an association of Dutch merchants, erected a redoubt and four small houses on the site of the present No. 39 Broadway. The promoters of the settlement were fur dealers who had long been engaged in trade with Archangel, but found their commerce impeded by the heavy duties and other imposts levied by the Russian government, and therefore sought to establish, in the New World, a station where they might enjoy liberty of trade. The venture proving successful, the Dutch merchants organized themselves under the style of the "United New Netherland Company," and secured from the States General of Holland a charter granting them a monopoly of trade with North America between the 40th and 45th parallels of N. latitude. This charter expired in 1618, and the application for its renewal was refused, though the company was allowed to continue trading for several years longer, under a special license. The reports of the fertility and other advantages of the country attracted general attention, and after the expiration of the charter of the New Netherland Company, the English Puritans, who were then arranging for their famous emigration, requested permission to settle in the new province. The States General, however, thought it wiser to establish a purely Dutch population, and on June 3, 1621, granted a charter to the West India Company, conferring on them exclusive rights over the territory of "New Netherlands" for twenty years; the company agreeing in return to colonize the province within a reasonable time. Thirty families of settlers were accordingly forwarded in 1623, chiefly French protestants, who had sought a refuge in Holland from persecution in their native country. An additional number of emigrants, with their families, were dispatched in 1625, together with a supply of farming implements and more than 100 head of cattle; and by the beginning of the year 1626 the population numbered about 200 souls. In that year Peter Minuit was appointed Director-General of the

new colony, and the territory of Manhattan Island was purchased from the Indians for sixty guilders, or about twenty-four dollars. Emigration from all countries was encouraged by the proprietary company, who furnished transportation at low prices, gave free grants of land, and proclaimed universal religious toleration. The company, however, reserved to itself the monopoly of the fur trade, and levied a duty of 5 per cent. on all other commerce. In 1633 Minuit was superseded as director-general by Wouter Van Twiller, a church and school-house were erected, and the first ordained pastor was installed. A number of negroes were imported from the Dutch West Indian possessions, and slavery became one of the institutions of the colony. The settlement on Manhattan island began at this time to be known as New Amsterdam. In March, 1638, William Kieft was appointed director-general, and endeavoring to enforce the payment of taxes by the neighboring Indians, provoked a war, in which the colony suffered greatly. In 1642 the first tavern was erected, at the company's expense, at the head of what was afterward Coenties Slip; the building was afterward altered into the "Stadt Huys," or City Hall. In 1647 Kieft was succeeded by Peter Stuyvesant, the last of the Dutch governors. By the year 1664 the population of New Amsterdam had increased to 1,500; ferries and markets had been established, and the streets were laid out with some degree of regularity; several distilleries and breweries were in operation, and a number of vessels had been built.

In September, 1664, an English fleet appeared before the city and demanded possession in the name of the Duke of York, to whom Charles II. had granted a patent including all lands and rivers from the Connecticut river to Delaware bay. Great Britain and Holland were at that time at peace, and the city being entirely defenseless, a surrender was inevitable. The British took possession, installed Colonel Nicholls as governor, and changed the name of the city to New York. The first charter of the city was granted by Governor Nicholls June 12, 1665. It placed the executive power in the hands of a mayor, sheriff, and five aldermen, all to be appointed by the governor. Thomas Willett was at the same time appointed the first mayor. In July, 1673, during the war between England and Holland, the Dutch regained possession, rechristened the city New Orange, and held it until 1674, when it again passed into English hands, its surrender being called for by the treaty of peace between the two parent countries. Under the Second Dutch administration the town was extensively fortified; a strong palisade was erected along the present Wall street, and numerous redoubts and blockhouses in other quarters. The city at this time was sparsely built, and presented but few of its present features. The East river reached to Pearl street, then known as the "Strand," or "Waterside," and the North river to the present Greenwich street. A canal or creek, walled with piles on either side, extended along the present Broad street to near the city wall.

With the year 1674 the history of the city under British dominion begins. Edmund Andross, afterward known in the Eastern colonies as "The tyrant of New England," was installed as governor, and one of his first acts was to refuse the prayer of the people of the city and colony for a representative assembly. He was succeeded in 1683 by Governor Dongan, under whom the first legislative assembly of the colony met in New York October 17, 1683. In 1686 the "Dongan charter," which has ever since been the basis of the municipal rights of the city, was granted. It conferred on the municipality jurisdiction over the entire island of Manhattan, to low water mark of the bays and rivers round

it; retained to the governor the appointment of the mayor, recorder, sheriff, coroner, high constable, town clerk, and clerk of markets; and provided for the election of aldermen, assistant aldermen, and petty constables annually. A new seal was also granted the city, bearing the beaver of the Dutch municipality, with the addition of a flour barrel and the arms of a windmill, supported by two Indian chiefs. In 1689, on arrival of news of the English Revolution, a large number of prominent citizens, under the leadership of the governor (Nicholson) were disposed to hold the city and colony for King James; the popular party, however, under the leadership of Jacob Leisler, a wealthy burgher of Dutch birth, rose up and seized the fort, expelled the Jacobite governor, and installed Leisler in authority. Meantime, Colonel Slaughter had been commissioned as governor by William and Mary. On his arrival in March, 1691, Leisler was arrested, tried for high treason, and condemned to death; the governor, however, refused to sign the warrant for his execution, but was finally persuaded to do so while intoxicated, and Leisler, with a son-in-law who had acted as his aid-de-camp, was hanged. The judgment was afterward reversed by the English Government, and Leisler's estates were restored to his children. For many years subsequently, the popular party among the citizens were known as "Leislerians." In 1696 the first Trinity church was erected, the Rev. William Vesey being installed as first rector, and the burying ground around the church being donated by the corporation. In 1699 a new city hall was erected on the corner of Wall and Broad streets. Toward the close of the seventeenth century, an undeniable notoriety attached to the city, as the headquarters of an organized system of piracy, the governor himself being accused of complicity. The famous Captain Kidd, a New York shipmaster, was commissioned by the authorities to proceed against the pirates, but hoisted the black flag, and returned to New York in 1698, after a most successful "cruise," with his ship laden with booty. Kidd was finally arrested in Boston and sent to England, where he was tried and hanged. In the year 1699 the property of the city was assessed for taxation at \$391,155. In 1705 the first free grammar school was established in the city. In 1725 the first newspaper, the *New York Weekly Gazette*, was established. An opposition paper, the *New York Weekly Journal*, was started in 1733. In 1730 Governor Montgomerie granted a new charter extending the jurisdiction of the city over the islands in the bay and East river, and authorizing the municipality to establish ferries, docks, and market-houses, and to enact ordinances for the government of the city. The first public almshouse was established in 1734. In 1741 the community was panic-stricken by the reported discovery of a plot among the slaves to burn the town and murder the whites; a number of whites and negroes were condemned and executed, fourteen of the latter being burned alive. The first theater was erected in 1750. In 1752 the first merchants' exchange was opened. In 1754 King's College, now Columbia, was founded. The chamber of commerce was chartered March 13, 1770. In the preliminary struggles of the Revolution New York took a prominent and decided part. The sympathies of the wealthier and more aristocratic portion of the community were largely with the British Government, but the middle and lower classes were imbued with the spirit of liberty, and carried all before them. The stamp act was energetically resisted, the stamp office razed to the ground, quantities of stamps destroyed, and public notices posted denouncing and threatening any person using stamped paper. The attempted imposition of the duty on tea was resisted with spirit; a cargo

brought by the ship *Nancy* was thrown into the bay April 22, 1774, and a few chests which had been smuggled ashore were seized and destroyed. During the greater part of the Revolutionary war New York remained in the possession of the British forces, who occupied it in September, 1776, after defeating Washington in the battles of Long Island and Harlem Plains. The night previous to the occupation a fire broke out on Broad street and destroyed about 500 buildings. Another in 1778 destroyed almost the entire eastern side of the town. The city was finally evacuated by the British troops November 25, 1783, about a thousand Tory families accompanying them. The first congress of the United States assembled in New York March 4, 1789; and on April 30th of the same year, George Washington was inaugurated president of the new republic at Federal Hall, on the site of the present sub-treasury building. For a short time after his inauguration, Washington occupied a house belonging to Samuel Osgood, at No. 1 Cherry street; but he soon removed to the Macomb house, No. 39 Broadway, the identical spot on which the first buildings were erected by Europeans on the island. But for a political intrigue New York might have remained the national capital, and the city of Washington might never have been founded. During the first session of congress it was proposed that the general government should assume, not only the debts contracted by the continental congress during the Revolutionary war, as to which there was no difference of opinion, but also the debts of the several States incurred during the same period, amounting to about \$25,000,000. This proposition was strongly opposed by the members from Maryland, Virginia, Georgia, and New Hampshire, States whose debts were comparatively insignificant, and many members from Pennsylvania joined in the opposition. Finally, through the agency of Thomas Jefferson and Alexander Hamilton, a compromise was effected. The members from Virginia and Maryland were induced to withdraw their opposition by an agreement that the seat of government should be permanently located in the District of Columbia, and the Pennsylvania members were conciliated by a pledge that before its final establishment at Washington the government should be transferred to Philadelphia for a term of ten years. During the Reign of Terror in Paris, New York became the refuge of a large number of French emigrants; and though many of these returned to France after the downfall of Robespierre, they left an impression on the social life of the city which has never been effaced. From 1784 to 1797 New York was the capital of the State of the same name. In 1798 occurred an epidemic of yellow fever, destroying 2,100 lives out of a population of about 55,000.

At the beginning of the nineteenth century the city proper had extended as far as Anthony street on Broadway, and Harrison street on the North river; the houses, however, were scattering, except at the lower part of the island, and surrounded by large gardens and vacant lots. Broadway had been graded as far as Canal street, where a stone bridge (now buried entire beneath the street) spanned a canal leading from the Collect Pond to the North river. The streets were numbered, and many of them furnished with brick sidewalks. The fashionable streets were Pearl, Nassau, and Pine streets, and the region adjacent to the present Battery park. The City Hall was at the junction of Nassau and Wall streets; the Almshouse, Bridewell, and prison occupied a portion of the present City Hall park. The Potter's Field was the present Washington square. The assessed value of taxable property was about \$7,000,000, on which the tax was generally one-

half of one per cent. 'Mechanics' wages averaged \$1 a day. A good house could be bought for \$3,000, or rented for \$350 a year.

In 1805 the public school society was founded, chiefly by Quakers, and its first school, No. 1, was opened May 17, 1806, in Madison street, near Pearl, with forty scholars. School No. 2 was opened in 1811, and other schools were thereafter added until 1842, when the present ward school system was established; the society, however, continued its operations till 1853, when its charter was relinquished, and its property turned over to the corporation. August 7, 1807, the first steamboat, the Clermont, made her first trip to Albany. In the same year the commercial progress of the city was checked by the operation of the National Embargo Act, prohibiting foreign commerce of every kind. This vexatious interference with trade continued, with some intermission, until April 19, 1812, when war with England was declared. At the outbreak of the war New York was practically undefended by any fortifications; and it was not till the spring of 1814, when the city was threatened by a British fleet, that the citizens took the matter into their own hands, and erected a chain of forts and batteries covering the approaches from the sea, and from the landward side. During the war trade was paralyzed, though much wealth was brought into the city by privateers. In 1811 the plan on which the city is now laid out was adopted; the streets, from the first on each side of the Bowery above Houston street, being numbered upward to the extreme end of the island, and the lines of the present avenues settled. Public parks were located on common lands, and at the junctions of ancient thoroughfares with the new avenues. Potter's Field became Washington Square; the junction of the Bowery and Broadway, Union Square; the junction of the Old and Middle Roads, Madison Square; and the great salt meadow on the east side was designated for draining and improving into Tompkins Square. In 1823 the city was again visited by an epidemic of yellow fever; the citizens deserted their dwellings, and took refuge in the northern part of the island, chiefly in Greenwich Village, in what is now the ninth ward, whither the banks, custom house, and public offices of every kind were removed; the infected district below the present City Hall park was walled up and all intercourse forbidden; owing to which precautions, the deaths were only 240 during the four months that the epidemic continued. In 1823 the first gas mains were laid in the streets.

The opening of the Erie canal in 1825 marked the beginning of the era of New York's present unexampled prosperity. Up to that time she had competed on comparatively equal terms with her sister cities of the Atlantic coast; but in the Erie canal she enjoyed a gateway to the rapidly growing West, which enabled her to set all competition at defiance, so that when railways were introduced New York had such control over the commerce between the East and West as to make her the unquestioned railway center of the country—the point from which all trunk lines must radiate if they would command a just proportion of the traffic. The statistics given elsewhere in this article show how rapid has been her progress.

In 1834 an amendment to the State constitution bestowed on New York, for the first time, the right of electing her own mayor, Cornelius W. Lawrence being the first officer so chosen. At the spring elections of the same year a proposal for supplying the city with water from the Croton river was submitted to popular vote, and adopted by a large majority. The construction of an aqueduct, forty miles in length, was at once

begun; and on July 4, 1842, the Croton water system was formally opened. December 16, 1835, a fire broke out in the lower part of the city, which raged for three days, and destroyed 648 houses and stores, with \$18,000,000 worth of property. The first transatlantic steamships, the Sirius and Great Western, arrived in port April 23, 1841. The first telegraph line connecting New York with Washington was opened in 1845; it was followed by a line to Albany, and other lines were opened in quick succession. May 10, 1849, the opposition of the "Native American" or "Know Nothing" party to the English actor Macready culminated in the attempt by a mob to burn the Astor Place opera house, where the actor was performing. A serious riot ensued, which was not quelled until the military had been called out, and several people killed and over 150 wounded. July 14, 1853, the "World's Fair for the Exhibition of the Industry of all Nations" was opened at the Crystal Palace on Reservoir Square. The palace was destroyed by fire October 5, 1858. In November, 1853, a commission was appointed to value land to be condemned for Central Park; the commission completed its labors in 1855, valuing the land at \$5,398,695; and the purchase was consummated by ordinance of the common council, February 5, 1856, \$1,658,395 of the purchase money being levied on the owners of adjacent property. The State arsenal and grounds were afterward bought for \$275,000. May 19, 1856, the mayor and street commissioners were appointed commissioners of Central Park; but work was not begun on any definite plan until April 17, 1857, when the control of the park was placed in the hands of a special board of commissioners. In the spring of 1857 the legislature amended the charter of the city by transferring the control of the police department from the mayor to a board of commissioners appointed by the governor. Mayor Fernando Wood declared the law unconstitutional, and refused to transfer the control of the police; and for a short time two distinct police forces were in existence. The dispute culminated in an attempt to arrest the mayor, which was forcibly resisted. The military were called out, and the mayor yielded; but the dissatisfaction of the "roughs" found expression in a riot on the east side of the city, which lasted several days, and involved serious loss of life.

The history of New York during the civil war is part of the history of the country. Although connected with the South by strong commercial ties, the people of the city were enthusiastic in their support of the Federal government and gave freely of men and money, furnishing a total of 116,382 men and officers. April 25, 1861, a meeting of ladies organized the Central Relief Association, which was afterward enlarged into the United States Sanitary Commission. In July, 1863, occurred the terrible draft riots, during which a number of mobs held possession of the city for three days; the killed and wounded were estimated by the police at 1,000. The city subsequently paid \$1,500,000 in indemnification for property destroyed. On May 2, 1865, the paid fire department was organized. In 1871 the celebrated Tweed Ring were hurled from power by the popular vote, and the action of the courts; but not until they had increased the city debt from \$50,000,000 to more than \$110,000,000, besides plundering the municipality in other ways. Since the close of the war the growth of New York has been steady and unprecedentedly rapid. The rush of settlement to the West, the growth of national population, the vast extension of the national railway system, the many inventions and improvements in labor-saving machinery, have all resulted in pouring upon her a steadily increasing flood of wealth. The centennial celebration of the founding of the

United States Government, and the first inauguration of Washington, on the three days ending May 1, 1889, was the last event of importance in the municipal history, and illustrated, with startling effect, the progress made by the city in a single century. Following in the footsteps of the first president of the republic, President Harrison landed at the foot of Wall street, attended service in St. Paul's chapel, and addressed the people from the site of Federal Hall. But the landing place which, in Washington's day, was well above the limits of the shipping, is now one of the first of the long line of wharves that line the East river shores; the church that then was almost in the country, is now miles from the residence district, and a day's march south of the city limits; the building which in Washington's day sufficed for all the departments of the national government, is now replaced by a far larger structure, whose capacity is taxed for the accommodation of a single branch of the treasury department; and the strangers who thronged New York to witness the celebration of 1889 exceeded, more than tenfold, the entire population of the city which bade Washington welcome.

Government.—The executive branch of the city government is administered by the following officials:

TITLE AND HOW CHOSEN.	Salaries.
Mayor, elected (1902, Hon. Seth Low).....	\$15,000
Commissioner of public works, appointed by mayor.....	8,000
Commissioner of street cleaning, appointed by mayor.....	6,000
Three commissioners of taxes and assessments, appointed by mayor.....	5,000
Four commissioners of police, appointed by mayor.....	4,000
Three commissioners of docks, appointed by mayor.....	5,000
Four commissioners of parks, appointed by mayor.....	5,000
* Two commissioners of health, appointed by mayor.....	7,500
Three commissioners of public charities and correction, appointed by mayor.....	5,000
Three commissioners of fire department, appointed by mayor.....	5,000
Three commissioners of excise, appointed by mayor.....	15,000
Comptroller, elected.....	12,000
Chamberlain, appointed by mayor.....	5,000
Two commissioners of accounts, appointed by mayor.....	15,000
Corporation counsel, appointed by mayor.....	4,000
Public administrator, appointed.....	4,000

* The president of the board of police is *ex-officio* a commissioner of health, but receives no salary on that account.

The legislative branch consists of a board of twenty-five aldermen, elected annually; and a board of estimate and apportionment, composed of the mayor, comptroller, president of the board of aldermen, and president of the department of taxes and assessments. The powers of the board of aldermen are limited to the enacting of ordinances, the granting of franchises for proper consideration or rental, and the formal voting of the tax levy settled by the board of estimate and apportionment. The board of estimate and apportionment are required to make yearly, between August and November, a provisional estimate of the amount required to defray the expenses of the city and county administration for the coming year. This estimate is forwarded to the board of aldermen and published in the *City Record* (the official paper of the city). The board of aldermen returns the estimate with any suggestions for amendment, and tax-payers have also a right to appeal and urge amendments. The board of estimate and apportionment then makes a final estimate, which constitutes the legal appropriation of the money.

The judicial branch comprises: The Court of Common Pleas, the Superior Court, the City Court, formerly

known as the Marine Court, eleven District Courts, the Surrogate's Court, the Court of Arbitration of the Chamber of Commerce, the Court of Oyer and Terminer, the Court of General Sessions of the Peace, the Court of Special Sessions of the Peace, and six Police Courts. The City Court has jurisdiction only in cases where the amount to be recovered does not exceed \$2,000. The District Courts are limited to cases involving not more than \$250. Besides these, terms of the United States Circuit and District Courts and of the Supreme Court of the State of New York are held within the city.

The officers of the county of New York (Manhattan Island) are the county clerk, salary \$3,000; the register, paid by fees; the surrogate, salary \$12,000; four coroners, salary \$5,000; and the sheriff, who is paid by fees. All are elective offices. The district attorney receives a salary of \$12,000; the commissioner of jurors, \$5,000; three members of the civil service advisory board, \$1,000 each. The mayor, comptroller, recorder, chamberlain, and chairman of the finance committee of the board of aldermen constitute the board of commissioners of the sinking fund for the redemption of the city debt. The board of education is composed of twenty-one commissioners, holding office for three years, of whom seven are appointed by the mayor annually. The board of commissioners of emigration consists of six members appointed by the governor of the State, and the mayor, the president of the Irish Emigrant Society, and the president of the German society. Nine wardens of the port are appointed by the governor to survey damaged vessels or cargoes, supervise the sales of sea damaged goods, and otherwise act in the interest of all concerned in cases of sea damage. The board of pilot commissioners consists of five members, three elected by the Chamber of Commerce, and two by the presidents and vice-presidents of the various marine insurance companies of the city.

The appropriation for Greater New York for 1901 is as follows: Mayoralty, \$63,755; municipal assembly and city clerk, \$200,052; finance department, \$842,305; taxes and assessments, \$334,450; interest on city debt, \$12,100,206; redemption of city debt, \$10,332,173; law department, \$399,758; board of city record, \$563,200; highways, \$2,178,144; sewers, \$801,350; bridges, \$431,728; public improvements, \$289,500; public buildings, lighting, and supplies, \$3,904,809; water supply, \$1,525,219; parks, \$1,863,288; public charities, \$1,895,491; police, \$11,938,343; department of health, \$1,053,990; correction, \$758,775; street cleaning, \$5,001,922; fire department, \$4,864,485; education, \$18,512,817; water supply department, \$1,525,219; department of buildings, \$546,525; assessors, \$42,700; coroners, \$165,150; judiciary, \$985,250; commissioners of accounts, \$156,000; charitable institutions, \$2,786,011; fund for street and park openings, \$1,184,553; libraries, \$299,663; miscellaneous, \$987,978; etc.; total (1901), \$98,096,413. The total receipts by the comptroller during 1898 were \$173,176,202, of which \$52,477,066 was from taxes. The total payments during 1898 were \$151,117,790. The total funded debt of the city January 1, 1898, was \$389,905,899, from which should be deducted the amount (investments and cash) held by the commissioners of the sinking fund, \$112,288,129, leaving the net debt \$277,617,770.

The city sends eight congressmen to the national house of representatives and twenty-four assemblymen and eight senators to the State legislature at Albany.

NEW ZEALAND consists of two large islands, the North Island and the South Island, of another much smaller one named Stewart Island, and of islets around the coast. The colony includes also the Chatham Islands and the Auckland Islands. The area of the North Island is 44,468 square miles, or 28,000,000 acres; that of the South or Middle Island is 58,525 square miles, or 36,000,000 acres; and Stewart Island has about 665 square miles, or 512,000 acres. The Chatham Islands and the Auckland Islands are of inconsiderable dimensions.

The mountains in the North Island occupy about one-tenth of the surface, and are covered with dense forests containing an almost inexhaustible supply of fine timber. In the northern half the mountains are not so frequent as in other parts, and do not exceed 1,500 feet in height. In the center there are some higher volcanic mountains; Tongariro (6,500 feet), occasionally active, Ruapehu (9,100 feet) and Mount Egmont (8,300 feet), extinct volcanoes. The main range of the island, beginning to the eastward of these mountains, is at its greatest height 6,000 feet. The plains in the North Island lie chiefly on the western side of the range. Mount Egmont is surrounded by an extensive and fertile district. Nearly four-fifths of the South Island is occupied by mountains. The greater part of them is open, well grassed, and adapted for pasture. The Southern Alps, as they are called, run close to the west coast the whole length of the island. Mount Cook, the highest peak, is 12,349 feet high, and has many glaciers. Extensive agricultural plains lie on the eastern side. The rugged western slopes are rich in mineral wealth.

There are countless running streams of the purest water throughout New Zealand, but not many rivers of depth and size. The Waikato is the chief river in the North Island. The Waioira, discharging itself into Kaipara harbor, is large and deep, and is navigable for vessels of considerable tonnage. In the South Island, the chief river is the Clutha, rising north of Lake Wanaka, and 220 miles in length. It flows into the sea about fifty miles south of Otago Harbor.

The lakes in New Zealand are a characteristic feature. Lake Taupo, in the central part of the North Island, covers an area of about 250 square miles. In the South Island there are numerous lakes, some of them of considerable extent, Lake Wakatipu covering 112 and Lake Te Anau 132 square miles.

The coast-line is over 3,000 miles. Cook Strait separates the two large islands, and Foveaux Strait separates the South Island from Stewart Island. A great number of natural harbors are included between the North Cape and Cape Colville. The harbors on the west coast of the North Island have shifting bars at the entrance; but Manukau, Kaipara, and Hokianga are excellently surveyed, and can, with due caution, be safely entered. Inside they are spacious and fine. Auckland and Wellington have excellent natural harbors. The South Island on its north side, from Cape Farewell to Cape Campbell, is indented with numerous good harbors; and on the eastern coast, Port Lyttelton, Akaroa, Port Chalmers, and the Bluff are all available for large vessels. Stewart Island is only 120 miles in circumference, and has several excellent harbors on its eastern side.

Meteorological statistics are collected at Auckland, Wellington, Christchurch, and Dunedin; and observations of rainfall, temperature, and wind-direction are received from thirty other stations.

The mean annual temperature of the North Island is 57°, and of the South Island 52°; that of London and New York being 51°. The mean annual temperature of the different seasons for the whole colony is in spring 55°, in summer 63°, in autumn 57°, and in winter 48°.

Rain is frequent. In the north the greater fall is during winter; in the south it is more equally distributed throughout the year. There is a much greater rainfall on the west than on the east coast, especially in the South Island.

On the whole, the New Zealand climate is admirably suited to Europeans.

The European population for 1896 was estimated to be 600,380. The native population (Maoris) was estimated at about 43,101 in addition, chiefly in the Northern Island.

The principal quartz-mines for gold are in the Thames and Coromandel districts, near Auckland, in the North Island, but several auriferous reefs are extensively worked in the Otago, Westland, and Nelson gold-fields, in the South Island. Alluvial gold mining chiefly exists in the Otago, Westland, and Nelson districts. Gold drift, as it is called, is found in river-beds and on the seacoast, where it can be worked with comparative ease, and also in thick deposits of gravel, the working of which requires mechanical water-power, and often large expenditure. The total quantity of gold produced in and exported from New Zealand from April 1, 1857, to March 31, 1883, was 10,144,926 ounces, valued at \$195,000,000. The quantity during the year ending March 31, 1901, was 445,559 ounces, valued at \$8,768,690. Good coal is obtained in many parts of New Zealand. The number of coal-mines in work in 1892 was 104; and the output during 1900 was 1,093,990 tons, the value of which was £546,995 (\$273,975). Silver is chiefly extracted from the gold produced in the Thames district, but other mines containing silver ores have been found. There are many other valuable ores—copper, iron, lead, zinc, antimony, chrome, and manganese—some of which are being worked. Several fine mineral oils also are obtained. Building-stones of various kinds and of excellent quality abound. Marble and cement stones occur in many places.

"In the whole colony there are about 12,000,000 acres of land fitted for agriculture, and about 50,000,000 which are better adapted for pasturage; but from these estimates allowance must be made for about 20,000,000 of surface at present covered by forest."

New Zealand is singular in the absence of all indigenous land mammals except two small kinds of bat. There are no snakes. A peculiar species of frog exists, but it is very rare. Insect life is not nearly so abundant as in Europe, though bloodthirsty sandflies swarm on the sea-shore, and mosquitoes in the bush. There are between four and five hundred species of mollusks. Seals are numerous on some parts of the coast. New Zealand is also remarkable for its wingless birds, living and extinct. The discovery and colonization of the country have completely changed the character of its animal life. Captain Cook introduced the English dog and the pig. Colonists have brought all kinds of domestic animals. Game and small birds have been imported and acclimatized; rabbits have become a formidable nuisance in many districts.

There are about one thousand species of flowering plants, of which about three-fourths are endemic. Most of those not peculiar to the country are Australian; others are South-American, European, Antarctic; and some have Polynesian affinities. Ferns and other cryptogamic plants are in great variety and abundance. There are a few indigenous plants and fruits used as food. *Phormium tenax*, or the New Zealand hemp, is a common and most useful plant. Forests covering from 11,000,000 to 12,000,000 acres are a characteristic feature in New Zealand vegetation. Much of the timber is of great value for building and for constructive works. The area of forest-land is rapidly diminishing.

and the rate of decrease in some large forests has been estimated at 4 per cent. per annum. The rapid decrease is stated to be due to reckless and wasteful consumption of the best timber without regard to the conservation of the young trees, to fires, and to other avoidable causes.

The principal crops of New Zealand are those indigenous to the temperate zone. In 1901, there were 62,786 holdings; 738,822 acres cultivated to grain; 394,473 acres to green and other crops, excluding grasses, and 4,517,960 acres to other kinds of crops, including sown grasses, and of land broken up but not under crop. The total number of acres was 34,911,573.

Except eels and a few small fishes of little worth, there are no indigenous fish in the rivers.

The natural features of the country were, for a long time after its colonization, a bar to overland internal communication, but in March, 1901, there were 2,300 miles of government railway lines in working order, and 163 miles more under construction; and the colony possessed in addition 88 miles of private lines, together with an excellent coaching system.

The value of the principal articles of export for the year 1900 was as follows: Wool, \$23,750,000; frozen meat, \$19,500,000; produce, \$15,400,000; gold, \$7,500,000, and of miscellaneous, \$9,400,000.

The total shipping inward during 1900 was 545 vessels of 742,551 tons, as compared with 765 vessels of 420,134 tons during 1881. The total outward during 1900 was 580 vessels (786,454 tons).

Tasman discovered New Zealand in 1642, and in 1769 Captain Cook took possession of the country for George III. The first settlement of Europeans was made in 1814, but no colonization took place until 1839, and in 1841 New Zealand was, by letters patent, erected into a separate colony distinct from New South Wales.

The general government consists of a governor, aided by a ministry, a legislative council appointed by the crown for life, at present consisting of forty-five members, and a house of representatives, to be reduced to seventy-five, elected for three years, four members of which are Maoris elected by the natives. Its seat is at Wellington. Local administration is vested in local elective bodies, such as municipal councils, county boards, road boards, and others, with power to levy rates. The colonial revenue is chiefly derived from customs, stamp duties, property tax, postal and telegraphic services, railways, and crown land sales. The proceeds of land sales are applied to surveys and public works. Crown lands are acquired at auction, or by selection, or on deferred payment, or by lease with right to purchase on certain conditions. The price is rarely less than \$5 an acre.

The system of education is free, secular and compulsory. There are 1,674 public schools with 3,586 teachers and 130,724 scholars, also 304 private schools with 15,555 scholars, in addition to 85 village schools for Maoris. The higher education of boys and girls in the cities and large towns is carried on in 23 endowed colleges and grammar schools, degrees being conferred by the university of New Zealand. Exclusive of the aboriginal population, the estimated population of New Zealand, in 1901, was 772,719.

It has always been difficult to collect the number of the aboriginal population. In 1878 the number returned was 43,595; in 1881, 44,097, of whom 19,729 were females. Those residing in the North Island were 22,872 males, and 18,729 females. The apparent increase in 1881 is believed by the registrar-general to be attributable to omissions in 1878. His conclusion is that on the whole there was a decrease from 1878 to 1881. If former estimates, partly conjectural, are at

all correct, the decrease during the last forty years has been considerable. The comparatively small proportion of females under fifteen years of age to the total population of both sexes in 1881, given as 15.35 per cent., renders future increase improbable.

The estimated population of its chief cities and towns in January, 1901, was as follows: Wellington and suburbs, 49,344; Auckland and suburbs, 67,226; Dunedin and suburbs, 52,390; Christchurch and suburbs, 57,041; Nelson, 7,660; and Sydenham, 11,404. The total pop. of New Zealand (1901) was 815,820, including 43,101 Maoris.

The Maoris, before their conversion, had no idea of a Supreme Being. Their notion was that all things had been produced by process of generation from darkness and nothingness. They believed that the spirit survives the body, and retires to some place under the earth, whence it occasionally returns to advise and sometimes punish the living. The Maoris are divided into tribes, which respectively had their chiefs and priests. Land was held by tribal tenure, and small plots were cultivated. Each tribe had its unwritten laws regarding land, cultivation, and other social matters. "Tapu," or the practice of making certain things sacred—a rule, the breach of which was severely punished by spirits and men—was an essential element in their code of law. Tribes were constantly fighting with each other, and the chief causes of strife arose from alleged wrongs to property and person. Cannibalism was practiced from vindictive feelings. Slaves were captives in war. The dead bodies of chiefs were put away on stages; and in course of time the bones were collected and hidden in secret places. The Maoris have a genius for war, and show great ability in building, fortifying, and defending stockades.

The Maori language is a Polynesian dialect. It closely approaches that of the Sandwich Islands, of the Navigators' group, and of Rarotonga. Natives of these mutually understand each other.

In 1814 the Rev. Samuel Marsden, colonial chaplain to the government of New South Wales, first established his church mission in New Zealand at the Bay of Islands. He was followed by others; and both Protestant and Roman Catholic missions were formed. In the course of the following thirty years almost the whole native population was converted, nominally, at least, to Christianity. There was in after years a considerable relapse; but the results of missionary teaching were, as a whole, great and permanent. Cannibalism ceased, and the barbarous nature of the race became softened and capable of civilization. The missionary paved the way for the colonist.

NEY, MICHEL, marshal of France, was born at Saarlouis on January 10, 1769, and in 1787 went to Metz and enlisted in a regiment of hussars. But for the Revolution he could never have become more than a sergeant, but in the new state of things he was elected lieutenant, and afterward (1792) captain of his regiment. He was aide-de-camp to General Lamarque in March, 1793, and soon after became lieutenant-colonel, when Kléber perceived his eminent military ability, and made him adjutant-general in August, 1794. He was promoted colonel in September, and in February, 1795, might have become general of brigade, but modestly refused the rank, alleging his own unworthiness. He commanded the advanced guard of Kléber at the battle of Altenkirchen, and was made general of brigade on the field of Forchheim. He then commanded the right wing of Hoche's army, and in 1798 took Mannheim. Sent next to Switzerland, he there reorganized Masséna's cavalry, and distinguished himself in Masséna's great campaign, in which he was three times wounded, and after which he was made general of division. In 1799 he com-

manded on the Rhine, and by his skillful operations obtained the armistice during which the *coup d'état* of Brumaire took place. In 1801 he was present at Hohenlinden, and in May, 1802, he married Mademoiselle Auguié, whom Josephine had chosen for him at Bonaparte's request. He became inspector-general of cavalry, and, after a short residence as minister in Switzerland, commandant of the camp of Montreuil. It was while there that in the name of the army he begged Napoleon to declare himself emperor, and on the establishment of the empire he was made marshal of France and grand cross of the Legion of Honor. In 1805 he commanded the sixth corps of the grand army, and by his victory at Elchingen, for which he was made duke of Elchingen, secured the surrender of General Mack at Ulm. He was then ordered to the upper Adige, and was present at Jena and Eylau, and was so instrumental in winning the battle of Friedland that Napoleon called him the *brave des braves*, and gave him the grand eagle of the Legion of Honor. In 1808 he was ordered to Spain with the sixth corps, and received the command of Galicia, which he managed to keep in subjection to the French in spite of the mountainous nature of the country. In 1810, in command of a *corps d'armée* under Masséna, he advanced into Portugal. For his opposition to Masséna Ney was recalled from Spain, but received the command of the third corps in the grand army of 1812. At the battle of the Moskva he so distinguished himself that he was made Prince de la Moskowa on the field, and in the disastrous retreat from Moscow it was Ney who commanded the rearguard, and kept the relics of the grand army together. He served at Lützen and Leipsic, and in the last defensive campaign of 1814, and with Macdonald remained faithful to Napoleon to the last. At the Restoration he was made a peer, and in 1815 was given the command of the army sent to check Napoleon on escaping from Elba. But the sight of the old colors and his old master was too much for him, and he led his troops over to Napoleon's side. In the Flemish campaign he fought the battle of Quatre Bras against the English on the same day that Napoleon defeated the Prussians at Ligny, and at Waterloo he commanded in person the last charge of the Old Guard. He made no attempt to leave France, and was arrested as a traitor; on December 5th he was found guilty of high treason by the House of Peers by 169 votes to 17, and two days later he was shot in the gardens of the Luxembourg.

NIAGARA, a river in North America forming a portion of the great lake and river system known as the St. LAWRENCE (*q.v.*), flows northward from Lake Erie (573 feet above sea-level) to Lake Ontario, separating the State of New York from the province of Ontario, in Canada, and with the thirty-three miles of its course makes a total descent of 328 feet. On issuing from Lake Erie the river is only about three-fourths of a mile broad, and for the first two miles is somewhat swift; it then divides and passes around Grand Island, broadens and assumes the tranquility of a lake until the commencement of the rapids, where it suddenly narrows and makes a descent of about fifty-two feet in the mile before its hurried and troubled waters are precipitated over a lofty chasm forming falls of unexampled grandeur. The breadth of the river immediately before making the leap is 4,750 feet, but the center is occupied by Goat Island, rising about forty feet above the water, and occupying a breadth of about 1,000 feet, a distance of about 1,400 feet separating it from the American side and about double that distance from the Canadian side, while the length of the verge line between the island and the Canadian side is moreover increased by an inward horseshoe curve. The height of the fall on

the American side is about 164 feet, and on the Canadian side about 150 feet; the discharge is about 18,000,000 cubic feet per minute. The waters plunge into an abyss about 1,000 feet wide, and during the next seven miles make a descent of about 104 feet through a deep ravine with perpendicular banks rising to a height of from 200 to 350 feet, the breadth of the river varying from 250 to 400 yards. Three miles below the great falls the whirlpool rapids are formed by a sudden turn in the channel causing the waters to impinge against the Canadian shore, where they have made a deep indentation, and to rush back to the American side in a great whirl or eddy, rendered more furious by the uneven bed of the river, and the narrow space into which it contracts. After issuing from the gorge at Lewiston, the river enters on a tranquil course, which continues to Lake Ontario. The point where the gorge ceases marks the termination of a table-land in an escarpment facing northward; and it has been generally held that the falls were situated here at the time when the river first began to flow, that is, subsequently to the great Ice Age. Recent study has suggested a much more complicated theory, making a great part of the gorge older than the Ice Age, and thus reducing the period for which the modern river has flowed from several hundred thousands of years to one-tenth of that time. The rate of recession is very uncertain; while it would appear from the best maps that some parts have receded at least 100 feet since 1841, others have remained more or less stationary. At the present site of the falls the edge of the cataract is formed by strata of hard limestone reaching to a depth of about eighty feet; and by the action of the spray the softer shaly strata below have been hollowed out so as to form the "Cave of Winds," which may be entered from the Canadian side. The river is crossed by a suspension bridge for foot passengers, about 250 yards below the falls, and a mile and a half farther down by two railway bridges about 100 yards apart—one of which has a carriage-way eighteen feet below; the other, a cantilever bridge, completed in December, 1883, carries a double line of rails.

The name Niagara ("thunder of waters") is the invention of an Indian tribe who adopted it as their own designation, from the fact that it was descriptive of the remarkable natural phenomenon situated within their territory. This tribe, on account of their peaceful proclivities, were also called the Neuter Nation; but, to avoid the fury of the Iroquois, they finally joined them in 1723 against the Hurons, and from this time they ceased to exist as a separate tribe. The first printed allusion to the cataract is in the record of a voyage by Jacques Cartier in 1535. Its position was first mentioned by Samuel Champlain in a map attached to his voyages published in 1613. The earliest description is that by Father Hennepin, who visited it in 1678, and published an account of it accompanied with a sketch giving a view of a third fall on the north side caused by the presence of a large rock on Table Rock. The rock and cascade are mentioned by Kalm, the Swedish naturalist, who visited Niagara in 1750, but they had disappeared a few years previously. Some writers, indeed, mention as many as six falls, and there can at least be no doubt that within the last 200 years the aspect of the falls has been greatly altered. Goat Island extended, up to a comparatively recent period, for about another half mile northerly in a triangular prolongation; and the number of small islands was perhaps larger than at present. Large masses fell in 1818, 1828, 1843, and 1847, and in June, 1850, Table Rock disappeared.

NIAGARA FALLS, a village of Niagara county, N. Y., situated at the Niagara falls, opposite Drummondville (on the Canadian side), and a mile and a half

above the contiguous village of Suspension Bridge, formerly Niagara City, which is connected by a suspension bridge with Clifton (on the Canadian side). Population, 1900, of 19,547.

NIAM-NIAM, a numerous and widespread Central African race, who were first visited by John Petherick in 1858, and have since been more fully described, especially by Piaggia, Doctor Schweinfurth, Dr. W. Junker, Potagos, and G. Casati. But none of these explorers have penetrated more than a few miles from the upper Nile and Welle basins into the Niam-Niam domain, which consequently still remains for the most part an unknown land.

NIAS ISLAND. See SUMATEA.

NIBELUNGENLIED, or NIBELUNGE NÖT, a great epic poem written in a Middle High German dialect. The story told in this poem belonged in its primitive form to the whole Teutonic race, and was composed originally of purely mythological elements.

NICÆA, or NICE, still called ISNIK, was an important town of Asia Minor, in Bithynia, on the lake Ascania. Antigonus built the city on an old deserted site, and soon afterward Lysimachus changed its name from Antigonía to Nicæa, calling it after his wife. Under the Roman empire Nicæa and Nicomedia disputed the title of metropolis of Bithynia. On the council held there in 325 A.D. see CREEDS and COUNCIL. The possession of the city was long disputed between the Greeks and Turks. It remained an important city for some time after its final incorporation in the Ottoman empire, but has decayed till it is now a poor and insignificant village.

NICANDER, a Greek poet, physician and grammarian, succeeded his father Damæus or Xenophanes as hereditary priest of Apollo at Clarus, the famous temple in the territory of the Colophonians. Hence he is often called Colophonius. He wrote a great number of works both in prose and verse, of which two are preserved.

NICARAGUA, one of the five states of Central America, forms an irregular equilateral triangle wedged in between Honduras and Costa Rica north and south, with base stretching for 280 miles along the Caribbean Sea from Cape Gracias à Dios southward to the San Juan delta, and apex at the Coseguina volcano, Gulf of Fonseca, which separates it on the Pacific side from San Salvador. The frontier toward Honduras, as laid down by the treaty of 1870, runs from the Gulf of Fonseca in a northwesterly direction along the Cordillera de Dipilto to 85° W., and thence a little north of and nearly parallel with the Rio Coco (Wanks) to the Atlantic above Cape Gracias à Dios. The Costa Rica frontier may be taken as practically defined by the course of the San Juan river and the south side of Lake Nicaragua to within fourteen miles of the Pacific, where it is marked by a conventional line drawn across the isthmus from the mouth of the Sapoa river to Salinas Bay on the Pacific. Within these limits, and including the Reserva Mosquita (Mosquito territory), the state comprises a total area of 49,200 square miles, with a population usually estimated at 400,000, but by the census of 1895 it was 380,000, or including uncivilized Indians, 420,000.

The low, monotonous, and swampy Mosquito Coast is broken by the two lagoons of Pearl Cay and bluefields, and is fringed by a few cays (islets) and reefs, such as Great and Little Corn, Longreef, and Tangweera, which shelter no harbors, and serve only to obstruct the navigation. Here the only port is Grey Town (San Juan del Norte), formed by the northern branch of the San Juan delta, and now nearly choked with sand. But the bold and rocky west coast, which extends for about 200

miles from Coseguina Point to Salinas Bay, although destitute of islands, presents a few convenient harbors, of which the chief are San Juan del Sur, Brito, and especially Realejo.

In Nicaragua the great geographical feature is the remarkable depression stretching for about 300 miles northwest and southeast parallel with the Pacific coast, and transversely to the Central American plateau, which it almost completely interrupts. This depression, which lies at a mean elevation of scarcely 100 feet above the sea, is now flooded by the two great lakes Managua and Nicaragua (Cocibolca), which collect nearly all the drainage of the western provinces, discharging it through the desagadero (outlet) of the Rio San Juan to the Atlantic. About midway between Lake Nicaragua and the Caribbean Sea, the San Juan entirely pierces the main chain of the Cordillera de los Andes, which here sweeps around the east side of the lacustrine basin at a mean height of 4,000 or 5,000 feet northward to the Honduras highlands. Toward the lakes the descent is very precipitous; but on the opposite side the land falls in broad terraced plateaus down to the Mosquito coast.

Throughout its entire length the depression is traversed by a remarkable volcanic chain of isolated cones, which north of the lakes takes the name of the Maribios, terminating in the extreme northwest with Coseguina (4,000 feet), and in the extreme southeast with the low wooded archipelagos of Solentiname and Chichicaste near the head of the desagadero. Between these two extremes the chief cones, proceeding southward, are—the Maribios chain, comprising El Viejo (6,000 feet), Santa Clara, Telica, Orotá, Las Pilas, Axosco, Momotombo (7,000 feet, highest point in the State); Masaya or Popocatepec and Mombacho (5,700 feet), near Granada; lastly, in Lake Nicaragua the two islands of Zapatera and Ometepe with the twin peaks Ometepe (4,100 feet) and Madera (4,190 feet). Several of these are still active, or at least quiescent, and in 1835 Coseguina was the scene of one of the most tremendous eruptions on record. The outbreak lasted four days, during which sand fell in Jamaica, Mexico, and Bogota. After a long repose Ometepe also burst into renewed activity on June 19, 1883, when the lavas from a new crater began to overflow, and continued for seven days to spread in various directions over the whole island.

No rivers of any size flow westward to the Pacific, the western provinces discharging, as already stated, mainly through the San Juan emissary to the Caribbean Sea. Yet Lake Managua, which lies sixteen feet above Lake Nicaragua, and 150 above sea-level, may now be regarded almost as a land-locked basin. Although nearly fifty miles long by twenty-five broad, with a mean depth of thirty feet, it seldom sends any overflow through the natural outlet of the Estero Panaloya (Tipitapa) down to the lower basin. It does not appear to have undergone any perceptible change of level since the conquest; but some of its former feeders have probably been displaced by the violent earthquakes, of which this region is a chief center. But the larger lake continues to receive the important Rio Frio from Costa Rica at its southeastern extremity, besides numerous perennial streams, especially from the western slopes of the Cordillera de los Andes. Hence there is an abundant discharge through the Rio San Juan, a deep, sluggish stream 128 miles long, from 100 to 400 yards broad, ten to twenty feet deep, but unfortunately obstructed by five dangerous rapids presenting serious obstacles to steam navigation. The lake itself is the largest freshwater basin between Michigan and Titicaca, being nearly 100 miles long by 40 broad and 240 feet deep in some places, but shoaling considerably, especially toward the outlet, where it falls six to

eight feet. Under the influence of the intermittent trade winds it rises and falls regularly toward the south side, whence the popular notion that it was a tidal lake. It is also exposed to the dangerous Papagayos tornadoes, caused by the prevailing northeasterly winds meeting opposite currents from the Pacific.

NICASTRO, an episcopal city of Italy, in the province of Catanzaro, sixteen miles west of Catanzaro and about six miles from the Gulf of Sta. Eufemia. There are two large suburbs—Zangaroma, founded by an Albanian settlement in the fifteenth century, and Bella, dating from 1782—and the communal population is 14,067.

NICCOLO PISANO. See PISANO.

NICE, a city of France, the chief town of the department of Alpes Maritimes, and previous to 1860 the capital of the countship of Nice (Aïzza), in the kingdom of Sardinia, occupies a fine position at the mouth of the Paillon (Paglione), a stream (often dried up in summer) which, after a course of twenty miles, enters the northern end of the Baie des Anges. A steep, isolated limestone hill, 315 feet in height, running back for some distance from the shore, forms the historical nucleus of the town. Formerly crowned by a castle, which, previous to its destruction by the duke of Berwick in 1706, was one of the strongest fortresses on the coast, it is now laid out as a public pleasure ground, and planted with aloe, cactus, agave, and palm. Toward its southwest corner stands a tower (Tour Bellanda or Clérissy) dating, it is believed, from the fifth century. The old town stretches along the western base of the hill; the "town of the eighteenth century" occupies the ground farther west which slopes gently toward the Paillon; and away to the northeast and northwest beyond the stream lie the ever-growing quarters of the modern city. The whole frontage of Nice is composed of fine embankments; the Quai des Ponchettes, constructed in 1770 around the base of the castle hill, is continued westward by the Quai du Midi as far as the Pont des Anges, which crosses the mouth of Paillon; and from the public gardens and the municipal casino on the other side of the stream the Promenade des Anglais, a boulevard eighty-five feet wide, extends for more than a mile to the mouth of the Magnan, and is likely to be prolonged to the Var. The course of the Paillon also is embanked on both sides, and at one part the Place Masséna, one of the largest public squares in the city, and the principal resort of foreign visitors, has been laid out across the stream. Besides a Roman Catholic cathedral—St. Réparate, dating from 1650—Nice possesses a Russian church, two synagogues, and several Protestant chapels. Architecturally the most remarkable church is Notre Dame, a modern Gothic building with two towers 213 feet high, erected by the town in 1835 to commemorate its preservation from cholera. The secular buildings include the town-house, the prefecture, the theaters, the hospitals, the lycée (founded by the Jesuits in the seventeenth century), the natural history museum, the library (especially rich in theology), and, at some distance from the town, the astronomical and meteorological observatory on Mount Gros. The industrial establishments comprise perfume factories, distilleries, oilworks, furniture and woodwork factories, confectionery-works, soapworks, tanneries, and a national tobacco factory, employing several hundred persons. In 1901 the population of the city was 125,099, and of the commune 66,279. During winter there is a large proportion of strangers from all parts of the world.

Protected toward the north by hills which rise stage behind stage to the main ridge of the Alps, Nice is celebrated for the mildness of its climate. The mean temperature is 60° Fahr., that of winter being 49°, of spring 56°, of summer 72°, and of autumn 63°. For

a few nights in winter the mercury sinks below freezing point, but snow is practically unknown, falling, on an average, only half a day in the year. The highest reading of the thermometer is rarely above 90°. For two thousand years the climate of Nice has been considered favorable in chest complaints. Those who are requiring rest, and those suffering from gout, asthma, catarrhs, rachitic affections, scrofula, stone, also experience benefit; but the reverse is the case when heart disease, nervous disorders, or ophthalmia are concerned. Autumn is the best season; in spring the sudden changes of temperature demand great care. Means of passing the time pleasantly are fairly abundant. The city is at its liveliest during the carnival festivities, in which, as at Rome, battles are waged with "confetti," and flowers.

NICEPHORUS I., emperor of Constantinople from 802 to 811, born at Seleucia in Pisidia, is alleged, on very doubtful authority, to have been a descendant of Jaballah, who had been monarch of the very small Arabian kingdom of Ghassán in the time of Heraclius, and for a time had professed the Mohammedan religion. In the reign of Irene he rose to the office of logothetes, or lord high treasurer, and in 802 he was joined by her favorite eunuchs in a plot by which she was dethroned and exiled, while he himself assumed the crown (October 31). Nicephorus in person took the field against Haroun al-Rashid, but sustained a great defeat at Crasus, in Phrygia; and subsequent inroads of his conquerors compelled him to sue for peace, which was granted only on condition of an annual tribute of 30,000 pieces of gold, besides three additional pieces (perhaps, as Finlay suggests, medallions of superior size) for himself, and three for his son Stauracius. By the death of Haroun in 809 Nicephorus was left free to turn his attention to the Bulgarians, whose warlike king, Crumm, had begun to harass the empire in the north; but six days after it had crossed the frontier the powerful Byzantine army was attacked in force by night, and Nicephorus, along with six patricians, many officers of high military rank, and a large number of rank and file, was put to the sword.

NICEPHORUS II. (Phocas), emperor of Constantinople from 963 to 969, was member of a brave Cappadocian family which had previously furnished more than one distinguished general to the empire. He was born about 912, joined the army at an early age, and under Constantine VII., Porphyrogenitus, attained the high rank of magnus domesticus, or general of the East (954). In the almost continual struggle with the Saracens which this post implied he sustained severe defeat in 956, but retrieved his fame in 958 and again in 959 in Syria; and in July, 960, he led the expedition against Crete which compelled Candia to surrender after a siege of ten months, and again brought the whole island under Byzantine rule. The long extinct honors of a triumph were revived to reward him on his return to Constantinople. In 962 he again set out with a large army against Syria; after forcing his way through the narrow passes of Mount Amanus, and compelling the principal cities to open their gates, he was pushing on toward the Euphrates when intelligence reached him in 963 that the emperor Romanus II. had died, leaving the empress Theophano regent for her infant sons. He returned to Constantinople, with the help of the patriarch, procured for himself the supreme command of the army during the minority of the princes, and, after gaining over the officers and soldiers to his interest, consented to allow himself to be proclaimed emperor. He was crowned on August 16th. In 964 he resumed the war against the Saracens, and, though compelled to raise the siege of Tarsus, was successful in capturing Adana and Mopsuestia; in the following year Tarsus

also was forced to surrender to himself, while Cyprus was reconquered for him by the patrician Nicetas. In 966 and 967 the internal affairs of the empire and threatening trouble in Hungary and Bulgaria detained him in Constantinople; but the spring of 968 saw him once more in the field against the caliph, and Laodicea, Hierapolis, Aleppo, Arca, and Emesa were added to his conquests. In the following year Antioch also fell, in the emperor's absence, into the hands of the patricians Burtzes and Peter, but Nicetas was less successful against Sicily. Meanwhile Nicephorus had not made himself so popular on the throne as in the camp. He was assassinated in his sleeping apartment on the night of December 10, 969. At the head of the conspirators was his nephew, John Zimisces, who succeeded him.

NICEPHORUS III. (Botaniates), emperor of Constantinople from 1078 to 1081, belonged to a family which claimed descent from the Roman Fabii. He served in the army, and rose to be commander of the forces in Asia. In 1078 he assumed the purple at Nicæa, almost simultaneously with Nicephorus Bryennius (father or uncle of the historian of that name), who had revolted against Michael VII. at Adrianople; the aristocracy and clergy of the capital supported the claims of Botaniates, who was crowned on March 25, 1078. On April 1, 1081, Nicephorus was forced to abdicate and become a monk of St. Basil.

NICEPHORUS BRYENNIUS. See **BYZANTINE HISTORIANS.**

NICEPHORUS, surnamed **CALLISTI**, the last of the Greek ecclesiastical historians, lived at Constantinople, perhaps as a monk in connection with the church of St. Sophia. He was born about the close of the thirteenth century, and died not later than 1356.

NICEPHORUS GREGORAS. See **BYZANTINE HISTORIANS.**

NICEPHORUS, a Byzantine historian, surnamed **PATRIARCHA**, was patriarch of Constantinople from 806 to 815.

NICHOLAS, St., of Myra, according to the Roman breviary (December 6th) was a native of Patara in Lycia, and was given to his parents in answer to their prayers. From his earliest infancy he signally displayed the piety for which his whole life was remarkable, on Wednesdays and Fridays regularly refusing to receive nourishment from his nurse except once only, and that after sunset. Having given himself wholly to God, Nicholas made a pilgrimage to Palestine, and in his vowing miraculously stilled a storm by his prayers. On his return to his native province he visited Myra, the capital, where, as it fell out, the bishop had just died, and the chapter had been divinely advised to select as his successor a man named Nicholas who should be the first to enter the church next morning. Nicholas, thus plainly indicated, was duly consecrated, and displayed throughout his whole term of office every episcopal virtue. Under Maximian and Diocletian he was seized for his constancy, removed far from his diocese, and thrown into prison, where he lay until the days of Constantine, when he returned to Myra. He afterward attended the council of Nice, and died a natural death not long after his return. His remains were subsequently removed to Bari (Barium), in Apulia. Nicholas is not mentioned among the Nicene fathers by any of the church historians of that or the succeeding century, and the earliest extant trace of his existence is in the fact that a church was dedicated to him in Constantinople by Justinian, about the year 560. Before the twelfth century his name had become very prominent both in the Eastern and in the Western Church, it is difficult to tell precisely why; and to this day he is one of the most popular saints in the orthodox Greek communion.

NICHOLAS I., sometimes called **The Great**, and certainly the most commanding figure in the series of popes between Gregory I. and Gregory VII., succeeded Benedict III. in April, 858. According to the annalist, "he owed his election less to the choice of the clergy than to the presence and favor of the emperor Louis II. and his nobles"—who can hardly have foreseen with what ability and persistency the rights of the holy see as supreme arbiter of Christendom were to be asserted even against themselves by the man of their choice. On the previous history of Nicholas nothing is recorded. His pontificate of nine years and a half was marked by at least three memorable contests which have left their mark in history. The first was that in which he supported the claims of the unjustly degraded patriarch of Constantinople, Ignatius. The second great struggle was that with Lothaire, the king of Lorraine (second son of the emperor Lothaire I., and brother of the emperor Louis II.), about the divorce of his wife Theutberga or Thietberga. The third great ecclesiastical cause which marks this pontificate was that in which the indefeasible right of bishops to appeal to Rome against their metropolitans was successfully maintained in the case of Rothad of Soissons, who had been deposed by Hincmar of Rheims. He died on November 13, 867, and was succeeded by Hadrian II.

NICHOLAS II., a Burgundian, whose Christian name was Gerard, was archbishop of Florence when he was chosen (December 28, 1058) at that place to succeed Stephen IX. in the papal chair. Some time previously the old Roman feudatory barons had caused to be consecrated, under the name of Benedict X., John, cardinal bishop of Velletri, who, however, was speedily deposed. The election of Nicholas had been brought about by Hildebrand (afterward Gregory VII.), and his whole pontificate derived its character from that master-spirit. Its first act of historical importance was the framing by the second Lateran council (April, 1059) of the decree which vested the election of popes in the cardinal bishops in the first instance, the assent of the cardinal priests and deacons being next required, then that of the laity, and finally that of the emperor. In the following June Nicholas visited Apuli, accepted the submission of the Normans, and removed the ban of excommunication, investing Richard in the principality of Capua, and Robert Guiscard in the dukedom of Apulia, Calabria, and Sicily. He died at Florence in June, 1061, and was succeeded by Alexander II.

NICHOLAS III. (Giovanni Gaetano), a member of the noble house of Orsini, succeeded John XXI. as pope on November 25, 1277. In 1278 he extorted from the newly-elected and insecurely-seated Rudolph of Hapsburg an absolute cession of the Romagna and of the exarchate of Ravenna, and in the same year he deprived Charles of Anjou of his vicariate of Tuscany. He was planning with Rudolph an entirely new distribution of the thrones of the empire, by which the royal dignity was to be conferred on more than one member of the house of Orsini, when a stroke of apoplexy brought his career to a sudden close on August 22, 1280. The successor of Nicholas III. was Martin IV.

NICHOLAS IV. (Girolamo de Ascoli), pope from February 22, 1288, to April 4, 1292, was born at Ascoli, of humble parentage. At an early age he entered the Franciscan order, of which he rose to be general in 1274, after the death of Bonaventura. It was in this capacity that in 1278 he condemned Roger Bacon to imprisonment on account of his writings. He subsequently became bishop of Præneste, and he was created cardinal by Nicholas III.

NICHOLAS V. (Tommaso Parentucelli), the pope whose name is most intimately connected with the

revival of learning, was the son of a physician, and was born at Sarzana, near Spezzia, in 1389. He received a good education at Bologna, became tutor in the Albizzi and Strozzi families at Florence, and ultimately entered into the service of Albergata, bishop of Bologna. He accompanied his patron to several embassies, and gained so high a reputation for diplomatic ability and for learning that shortly after Albergata's death he himself obtained the see of Bologna, was sent by Eusebius IV. on an embassy into Germany, and in December, 1446, was made a cardinal. In less than three months he was pope in succession to Eugenius. He aimed especially at making Rome architecturally a worthy capital of the Christian world; he repaired its fortifications, began the rebuilding of its cathedral, enlarged and adorned its thoroughfares, and traced much of the plan of restoration executed by his successors. But his great glory was his active coöperation in the revival of learning. Under him the papacy regained much of its former luster, and till late in his reign his administration was disturbed by no unfortunate events. He died on March 24, 1455. He was succeeded by Calixtus III.

NICHOLAS V. (Pietro di Corvara), antipope in Italy from 1328 to 1330, during the pontificate of John XXII. at Avignon, was a native of the Abruzzi and a member of the Franciscan order. He owed his nomination to the papacy, and his election (May 12, 1328) by popular acclamation, to the influence of the excommunicated emperor Louis the German, on whose head he placed the crown after his own enthronement. Carried to Avignon, on making full confession and abjuration of his heresies and impieties (September 6, 1330), he was kept in honorable imprisonment in the papal palace until his death in 1334.

NICHOLAS I., czar of Russia, third son of Paul I., was born at Tsarkoe-Selo on June 25, 1796. His elder brothers were Alexander and Constantine, of whom the former was twenty years his senior. Their father was murdered in 1801, and Alexander then became emperor. The education of Nicholas was conducted under the care of his mother, a pious but narrow-minded woman. He was brought up in retirement, and even during the invasion of Russia by Napoleon in 1812 he was not permitted to serve in the army. His tastes, however, were all military, and his favorite studies mathematics and fortification. During the campaign of 1814 in France he was allowed to come to the allied headquarters, but not to take part in any engagement. He married, in 1817, Louise Charlotte, daughter of Frederick William III., king of Prussia, and this union had for half a century an important effect on the history of Prussia and Germany at large. Alexander having no sons, Constantine was heir to the throne. This brutal and ignorant prince had, however, the sense to recognize his own unfitness for the task of governing an empire, and, by a secret agreement with the reigning sovereign, he renounced his rights in favor of Nicholas. Alexander died on December 1, 1825. Constantine, who was in Poland, showed no inclination to prefer his claims; the edict of the late emperor appointing Nicholas his successor was opened, and the younger brother was called by the highest authorities of Russia to assume the crown. He nevertheless refused, and, as it would seem, in perfect sincerity, until Constantine had formally confirmed his renunciation. The delay led to serious consequences. Conspiracies against the late emperor and in favor of a freer government had been formed in the army and among the nobles; and when the troops at St. Petersburg were called upon to take the oath to Nicholas, revolt broke out. The young czar showed great nerve and courage, but the mutiny was not put down without bloodshed, and the impres-

sion which it left on his mind never passed away. The maintenance of despotic power was a duty to which he devoted himself with the deepest religious conviction. At the accession of Nicholas, Russia had been for some years on the brink of war with the Porte. Greece was in insurrection, and Russia had its own specific causes of complaint in consequence of the alleged infraction of the privileges of the Danubian provinces guaranteed by the treaty of Bucharest.

England and Russia undertook to tender their mediation, requiring the sultan to grant the Greeks a modified independence, and the concert was subsequently joined by France. The result of this combination, and of Ottoman obstinacy, was the destruction of the Turkish fleet at Navarino by the allied squadrons, and the establishment of Greek independence. This, however, did not terminate the contentions between Turkey and Russia. The Porte itself challenged war, and in 1828 hostilities broke out. Nicholas took part in the first and unsuccessful campaign of 1828, but allowed his generals to act by themselves in 1829; and the march of Diebitsch over the Balkans was followed by the peace of Adrianople. A Persian war had already been successfully concluded, and Russia had gained thereby two provinces in the east. The peace of Adrianople gave it only an improved frontier on the eastern shore of the Black Sea. In 1830 the fall of the Bourbons made an end of the friendship which existed between France and Russia, and restored the union between the three despotic courts of St. Petersburg, Vienna, and Berlin, which had been framed in 1814 and interrupted by the course of Eastern affairs. The insurrection of Poland soon followed. Alexander had received the grand-duchy of Warsaw from the congress of Vienna as a separate kingdom, united with Russia only in the person of its ruler; and he had fulfilled his promise of granting it a constitution, and treating it as a distinct nationality. The violation of these rights by the grand-duke Constantine, who was governor of Poland, and the virtual establishment of dictatorial rule, caused the insurrection against Nicholas. The Polish leaders sent their demands to St. Petersburg; Nicholas replied that he would answer them with cannon. The diet now pronounced his dethronement as king of Poland, and the armed struggle began. It was a long and doubtful one, for Poland had a regular army of its own; but the victory was at length won by Nicholas, and he showed no mercy to his conquered enemy. Poland was made a Russian province; its liberties were utterly extinguished; its defenders were sent by thousands to Siberia. During the years that followed, the struggle between the sultan and his vassal, Mehemet Ali, pasha of Egypt, brought the Eastern question again to the front of European affairs. Nicholas watched the events of 1848, and strengthened his army. So long as revolution did not approach his own frontiers he was willing to hold his hand; but when Hungary rose against the Hapsburgs and established its national independence he felt that Poland would soon follow its example, and sent his soldiers to crush the Magyar armies which Austria had not been able to subdue. His aggressions upon the Ottoman empire, continued up to 1853, brought England and France into the field against him. His armies were defeated at Alma and Inkermann, his fortresses besieged; and in the bitterness of defeat death came upon him, February 18, 1855. Shortly before his death he is said to have laid two injunctions upon his son and successor—to liberate the serfs, and never to grant Poland a constitution.

NICHOLAS OF BASEL, generally called by his friends the Great Layman or the Great Friend of God.

was the founder of a singular widespread association of pious people who, in the age of monastic fraternities, lived in special religious fellowship in a fashion altogether different from the common usage of the time. They did not renounce their property, they took no vows of celibacy or of obedience, but they met together for pious conversation, they corresponded with each other, they had common ideas about conversion, holy living, and Christian faith and duty. They were the Quietists of the fourteenth century, and called themselves the "Friends of God."

Nicholas was the son of a rich merchant of Basel, and was born in that town about the year 1308. The most striking event in the life of Nicholas is his meeting, in 1346, with Tauler, the Dominican preacher of Strasburg, resulting in Tauler's conversion. Nicholas was burned *circa* 1395.

NICHOLS, JOHN (born in 1745, died in 1826), ranks among the most industrious and voluminous of English antiquaries and collectors. He was editor of the *Gentleman's Magazine* for nearly half a century, from 1778 till his death, and, partly in his magazine and partly in his numerous volumes of *Anecdotes and Illustrations*, made invaluable contributions to the personal history of English men of letters in the eighteenth century.

NICHOLSON, WILLIAM, a writer on natural philosophy, was born in London in 1753, and died in 1815.

NICHOLSON, WILLIAM, portrait-painter, was born at Newcastle-on-Tyne in 1784. Having settled in Edinburgh, he became one of the founders and most vigorous promoters of the Scottish Academy, of which, in 1826, he was appointed secretary. Nicholson died at Edinburgh on August 16, 1844.

NICIAS was the leader of the aristocratic party at Athens and one of the foremost figures in Athenian history during the Peloponnesian War. Although he opposed the democratic tendencies which gave the tone to Attic politics at this time, his high character for piety and honesty, combined with his wealth and influence, gained the confidence of the people, and raised him to the highest offices in his gift. (See GREECE.)

NICKEL, a chemical term, designating a metallic element which was discovered by Cronstedt in 1751. In 1754 he succeeded in isolating it (in an impure state), and found it to be a "halbmetall" (semi-metal). Afterward finding it to be present largely in "kupfer-nickel," he borrowed from that mineral the name for his new element. Nickel (Ni) is one of the less abundant of elements. It is contained in the sun's atmosphere and in all meteoric iron. Of nickel minerals the following are of metallurgic importance: Nickel-blende, arsenical nickel glance, niccolum-cobaltic pyrites, garnierite. Almost invariably part of the nickel is replaced by cobalt, and not infrequently part of the arsenic by antimony, or occasionally bismuth. Nickel ores are in general complex mixtures of one or more of these minerals, with sometimes very large proportions of copper, iron, and other foreign metallic ores and gangue. The metallurgy of nickel accordingly is a complex subject which cannot be fully treated here.

Ordinary cube-nickel contains from 94 to 99 per cent. of real nickel. The purest commercial metal is that extracted from the New Caledonian ore; it often contains only a fraction of 1 per cent. of impurities. The best commercial cube-nickel (although it may contain less than 1 per cent. of impurities) is always utterly devoid of plasticity; it breaks under the hammer, although the pure metal, as was shown as early as 1804 by Richter, and confirmed by Deville in 1856, is highly ductile and tenacious. It is attracted by the magnet. Its specific gravity is 8.179 for ingot, and 8.666 for the forged

metal. It can be welded at a red heat like wrought iron, which it exceeds in relative infusibility. It does not tarnish even on long exposure to the air. Sulphureted hydrogen does not blacken it. Liquid water, even in the presence of air, has no action upon it. Aqueous non-oxidizing acids act upon it as they do on iron, but more slowly. Nitric acid and aqua regia dissolve it as nitrate and chloride respectively. When heated strongly in air it is gradually oxidized; it decomposes steam, slowly, at a red heat. In brief, it unites in itself all the virtues of iron with some of the characteristics of the noble metals, and yet its application in the mechanical arts was never thought of until Fleitmann, in 1879, made the remarkable observation that the addition of one-eighth of one per cent. of magnesium to the metal imparted to it all the plasticity of the pure metal.

Nickel Electroplating.—This art, invented by Böttcher about 1843, has developed into an important industry, especially in the United States. The best kind of solution to use is one of the double sulphate of nickel and ammonia, which should be saturated at 25° and used in conjunction with a plate of nickel as positive electrode.

Alloys.—Nickel alloys were used practically long before Cronstedt's discovery of the metal. GERMAN SILVER (*q.v.*), long known to the Chinese as "Pack Tong," *i.e.*, "white copper," consists of nickel, copper, and zinc united in varying proportions—3 of copper, 1 of zinc, and 1 of nickel is said to give the most silver-like alloy. An alloy of "German" with real silver has lately been introduced as "tiers-argent;" it consists of silver 27.6, copper 59.0, zinc 9.6, nickel 3.4 per cent. In the United States, in Belgium, and in Germany, an alloy of 1 of nickel with 3 of copper serves for the making of minor coins. All these alloys are non-magnetic.

NICOBARS, a cluster of eight large and twelve small islands in the Bay of Bengal, lying to the south of the Andamans, with a population, exclusive of aborigines, of 308. The largest island, the Great Nicobar, is about thirty miles in length and from twelve to fifteen in breadth. Many of the islands are hilly, with peaks of considerable height; others are flat and covered with forests of cocoa-nut trees. All are well wooded. Tropical fruits grow in abundance, and yams of fine quality and size. The Nicobar swallow is the builder of the edible bird's nest, which, together with trepang (*bêche-de-mer*), cocoa-nuts, tortoiseshell, and ambergris, forms the whole export of the islands.

NICOL, WILLIAM, the inventor of the invaluable polarizing prism, was born about 1768, and died at Edinburgh, in September, 1851.

NICOLAÏ, CHRISTOPH FRIEDRICH, a German author and bookseller, was born on March 18, 1733, at Berlin, where his father was a bookseller. He was educated at Berlin, and in 1749 went to Frankfurt-on-the-Oder to learn his father's business. In 1752 he returned to Berlin, and soon began to take part in current literary controversy. At that time the leaders of critical opinion in Germany were Gottsched and Bodmer. In 1755 Nicolai issued a book, *Briefe über den jetzigen Zustand der schönen Wissenschaften*, in which he tried to show that each of these writers was in his own way narrow and intolerant. This work secured for the author the friendship of Lessing, whose power as a critic was then beginning to be recognized. For many years (from 1765 to 1791), Nicolai edited the *Allgemeine deutsche Bibliothek*, a periodical which served as the organ of the so-called popular philosophers, who warred against authority in religion and against what they conceived to be extravagance in literature. The new movement of ideas represented by Herder, Goethe, Schiller, Kant, and Fichte he was

incapable of understanding, and he made himself ridiculous by foolish misrepresentation of their aims. Nicolai died on January 8, 1811.

NICOLAIEFF. See NIKOLAIEFF.

NICOLAS, SIR NICHOLAS HARRIS, English antiquary, was born March 10, 1799, at East Looe, in Cornwall, and died at Cape Curé, near Boulogne, in 1848.

NICOLE, PIERRE, one of the most distinguished of the Port-Royalists, a scholar of great excellence, and, according to Bayle (who had no particular reason for praising him), "one of the best writers in Europe," was born at Chartres in 1625. The first volume of his *Essais de Morale* appeared in 1671, and the rest of his life was chiefly occupied on this book, though he wrote many others. He died in 1695.

NICOMEDES I., son of Zipoetes, succeeded his father as king of Bithynia in 278 B.C. He enlarged and consolidated the kingdom, which had been founded by his father in 288, and founded the great city of Nicomedia as the capital. He was for some time engaged in war with Antiochus of Syria, and invited the Gauls under Leonnorius and Lutarius to cross into Asia Minor and help him against his foreign and domestic enemies. His reign seems to have been long, prosperous, and uneventful; the year of his death is unknown.

NICOMEDES II., fourth in descent from the preceding, was son of Prusias II. He was so popular with the people that his father became jealous and sent him to Rome. Here he was so much favored by the senate that Prusias sent an ambassador, Menas, to Rome, giving him secret orders to assassinate Nicomedes. Menas revealed the plot, and persuaded the prince to rebel against his father. Supported by Attalus II., king of Pergamum, he was completely successful, and ordered his father to be slain before the altar of Zeus in Nicomedia. Nicomedes reigned from 149 to 91 B.C., and during his long reign adhered steadily to the Roman alliance.

NICOMEDES III., son and successor of the preceding. His brother Socrates contested the kingdom with him, relying on the alliance of the great Mithridates. Nicomedes was established on the throne by Roman help in 90 B.C., but expelled by Mithridates in 88, after a great defeat in Paphlagonia. In 84 he was restored by the Romans. In 81 Julius Cæsar, sent to him by his commander, became so intimate with him as to give rise to great calumnies at home. He died in 74 B.C., and bequeathed his kingdom to the Romans.

NICOMEDIA, a town at the head of the Sinus Astacenus, which opens on the Propontis, was built in 264 B.C., by Nicomedes I., king of Bithynia, and has ever since been one of the chief towns in this part of Asia Minor. It still retains the ancient name under the form Ismid. It was the metropolis of Bithynia under the Roman empire (see NICEÆA); Diocletian made it the capital of the East, and fixed his court there. It retained its importance even after Constantinople was founded, for the roads from all parts of Asia Minor to the capital converge at Nicomedia.

NICOPOLI. See NIKOPOLI.

NICOPOLIS, or ACTIA NICOPOLIS, an ancient city of Epirus, founded 31 B.C., by Octavian, in memory of his victory over Antony and Cleopatra at Actium. The colony, composed of settlers from a great many of the towns of the neighboring countries (Ambracia, Anactorium, Calydon, Argos Amphiloichium, Leucas, etc.), proved highly successful, and the city was considered the capital of southern Epirus and Acarnania, and obtained the right of sending five representatives to the Amphictyonic council. The ruins of Nicopolis, now known as Paleoprevesa (Old Prevesa), lie about

three miles north of that city, on a small bay of the Gulf of Arta (Sinus Ambracius) at the narrowest part of the isthmus of the peninsula which separates the gulf from the Ionian Sea. Besides the acropolis, the most conspicuous objects are two theaters (the larger with twenty-seven rows of seats) and an aqueduct which brought water to the town from a distance of twenty-seven miles.

NICOSIA is the name in common use, though originally a mere corruption of the Greek name Lefkosia, for the capital of Cyprus. It is situated in the midst of the great plain of Mesaria, which traverses the island from sea to sea, and is nearly equidistant from the Gulf of Morphu at one end and that of Famagosta at the other. It became the capital of the island under the kings of the Lusignan dynasty, who were the rulers of Cyprus from 1192 to 1489. Like many other Oriental towns, Nicosia has rather an imposing effect from a distance, in consequence especially of its lofty walls, built by the Venetians to replace the previously existing circuit, which remain unbroken to the present day. Above these towers the beautiful Gothic cathedral, now converted into a mosque. But the interior of the city is a mere labyrinth of narrow streets, and presents an aspect of great decay. The population of Nicosia, the capital of Cyprus (which is now in British occupation), was, in 1901, 14,752.

NICOSIA, a city of Italy, in the province of Catania, in Sicily, about fifty miles west of Catania, near the rise of the Seminato. It is a picturesque mediæval-looking place, with a cathedral in the Norman style, a communal library, mineral wells, and a trade in grain, wine, and oil. The population of the commune was about 17,000 in 1901.

NICOTINE. See TOBACCO.

NIEBUHR, BARTHOLOMÆUS GEORG, the historian of ancient Rome, was the son of Karsten Niebuhr, noticed below, and was born at Copenhagen on August 27, 1776. His family was of Hanoverian extraction. From the earliest age young Niebuhr manifested extraordinary precocity, and especial interest in history and politics. From 1794 to 1796, being already a finished scholar and acquainted with several modern languages, he studied at the university of Kiel, applying himself to mathematics, logic, philosophy, and other studies previously neglected. In 1800 he married and settled at Copenhagen. In 1804 he became chief director of the National Bank, but in September, 1806, after negotiations which had extended over more than a year, quitted this for a similar appointment in Prussia.

He arrived in Prussia on the eve of the catastrophe of Jena, and shared to the full all the disasters and miseries which overwhelmed the monarchy. He accompanied the fugitive government to Königsberg, where he rendered considerable service in the commissariat, and was afterward still more useful as commissioner of the national debt, and by his opposition to ill-considered schemes of taxation. He was also for a short time Prussian minister in Holland, where he endeavored, without success, to contract a loan. In 1810 he retired for a time from public life, accepting the more congenial appointment of royal historiographer and professor at the university of Berlin. He commenced his lectures with a course on the history of Rome. The enthusiastic reception these experienced filled him with delight. He recognized that he had found his vocation, and henceforth regarded the history of Rome from the earliest age to Augustus as the task of his life. The first two volumes, based upon his lectures, were published in 1812, but attracted little attention at the time, owing to the absorbing interest of political events. In 1813 Niebuhr's own attention was diverted from history by

the uprising of the German people against Napoleon; he entered the landwehr, and ineffectually sought admission into the regular army. He edited for a short time a patriotic journal, *The Prussian Correspondent*, joined the headquarters of the allied sovereigns, and witnessed the battle of Bautzen, and was subsequently employed in some minor negotiations. He next accepted the post of ambassador at Rome, which he probably thought would assist his historical labors, and departed to assume that office in July, 1816. During his residence in Rome he discovered and published fragments of Cicero and Livy, aided Cardinal Mai in his edition of Cicero *De Republica*, and shared in framing the plan of Bunsen and Platner's great work on the topography of ancient Rome, to which he contributed several chapters. He also, on a journey home from Italy, deciphered in a palimpsest at St. Gall the fragments of Flavius Merobaudes, a Roman poet of the fifth century. In 1823 he resigned the embassy and established himself at Bonn, where the remainder of his life was spent, with the exception of some visits to Berlin as councillor of state. He here rewrote and republished (1827-28) the first two volumes of his *History*, and composed a third volume, bringing the narrative down to the end of the First Punic War, which he did not himself entirely complete, but which, with the help of a fragment written in 1811, was edited after his death by Professor Classen. He died on January 2, 1831.

NIEBUHR, KARSTEN, Eastern traveler, was born at Lüdingworth, Launenburg, on the southern border of Holstein, March 17, 1733, the son of a small farmer. He had little elementary education, and for several years of his youth had to do the work of a peasant. His bent was toward mathematics, and he managed to obtain some lessons in surveying. It was while he was working at this subject that one of his teachers, in 1760, proposed to him to join the expedition which was being sent out by Frederick V. of Denmark for the scientific exploration of Egypt, Arabia, and Syria. To qualify himself for the work of surveyor and geographer, he studied hard at mathematics for a year and a half before the expedition set out, and also managed to acquire some knowledge of Arabic. The expedition sailed in January, 1761, and, landing at Alexandria, ascended the Nile and devoted some time to the examination of the pyramids and of the hieroglyphic writings of Egypt. Niebuhr stayed fourteen months at Bombay, and then returned home by Muscat, Bushire, Shiraz, and Persepolis, visited the ruins of Babylon, and thence went to Bagdad, Mosul, and Aleppo. After a visit to Cyprus he made a tour through Palestine, crossing Mount Taurus, to Brussa, reaching Constantinople in February, 1767, and Copenhagen in the following November. On his return Niebuhr at once set himself to the task of preparing the records of the expedition. His first volume, *Beschreibung von Arabien*, was published at Copenhagen in 1772, the Danish Government defraying the expenses of the abundant illustrations. This was followed in 1774-78 by other two volumes, *Reisebeschreibung von Arabien und Anderen umliegenden Ländern*. The fourth volume was not published till long after his death in 1837, under the editorship of Niebuhr's daughter. To a German periodical, the *Deutsches Museum*, Niebuhr contributed papers on the interior of Africa, the political and military conditions of the Turkish empire, and other subjects. He married in 1773, and for some years held a post in the Danish military service which enabled him to reside at Copenhagen. In 1778, however, he accepted a position in the civil service of Holstein, and went to reside at Meldorf, where he died, April 26, 1815.

NIELLO (Italian form of Latin *nigellum*, diminutive of *niger*, "black"), a method of producing delicate and minute decoration on a polished metal surface by incised lines filled in with a black metallic amalgam. In some cases it is very difficult to distinguish niello from black enamel; but the black substance differs from true enamel in being metallic, not vitreous.

The earliest specimens of niello now existing belong to the Roman period. Two fine examples are in the British Museum. One is a bronze statuette of a Roman general, nearly two feet high, found at Barking Hall, in Suffolk. The dress and armor have patterns partly inlaid in silver and partly in niello. The dark tint of the bronze rather prevents the niello from showing out distinctly. This statuette is apparently a work of the first century. The other example is not earlier than the fourth century. It is a silver casket or lady's toilet-box, in which were found an ampulla and other small objects, enriched with niello-work. From Roman times till the end of the sixteenth century the art of working in niello seems to have been constantly practiced in some part at least of Europe, while in Russia and India it has survived down to the present day.

NIEMCIEWICZ, JULIAN URSIN, was born in 1757, in Lithuania. In the earlier part of his life he acted as adjutant to Kosciuszko, was taken prisoner with him at the fatal battle of Maciejowice (1794), and shared his captivity at St. Petersburg. On his release he traveled for some time in America, where he married. He died as an emigrant at Paris in 1841. Nieciewicz tried many styles of composition. He wrote comedies (one of which, *The Return of the Deputy*, enjoyed a great reputation), tragedies, and a novel, *John of Tenczyn*, in the style of Scott, which gives a vigorous picture of old Polish days. He was also the author of a *History of the Reign of Sigismund III*.

NIEPCE, JOSEPH NICÉPHORE, one of the inventors of photography, was born at Châlon-sur-Saône on March 7, 1765. He gave himself to mechanical and chemical researches; and in 1811 directed his attention to the rising art of lithography. In 1813 the idea of obtaining sun pictures first suggested itself to him in this connection; the history of the subsequent development of the conception will be found under DAGUERRE and PHOTOGRAPHY. Niepce died at Gras, his property near Châlon, on July 3, 1833. A nephew, Claude Félix Abel Niepce de Saint-Victor (1805-1870), served with distinction in the army, and also made important contributions toward the advancement of the art of photography (actinescence).

NIEVRE, a central department of France, formed out of the old province of Nivernais with a small portion of the Orléanais, is bounded northwest by Loiret, north by Yonne, northeast by Côte d'Or, east and southeast by Saône-et-Loire, southwest and west by Allier, and west by Cher. It belongs partly to the basin of the Loire, partly to that of the Seine. The largest Seine tributary in Nièvre is the Yonne, which rises in the southeast, passes by Clamecy, and carries along with it the northern part of the Nivernais Canal. The Cure, the principal affluent of the Yonne (with which, however, it does not unite till after it has left the department), is the outlet of a lake, Lac des Settons, which serves as a reservoir for the practical regulation of the river. The watershed between the two river systems runs, like the general slope of the department, from southeast to northwest, the highest summits belonging to the Morvan, an uplift of granite, porphyry, and gneiss, which extends into Saône-et-Loire, Côte d'Or, and Yonne. Here stands Mount Prényerey (2,790 feet), the highest point in Nièvre; and seven or eight miles north-northwest, at an altitude of nearly

2,000 feet, is Château-Chinon, the highest town in the department. The lowest level in the department is 443 feet, at the exit of the Loire. Morvan ("Black Forest") is one of the most picturesque portions of France; and the western district, known as the "Bon Pays," is one of its finest pastoral areas, terminating toward the Loire in hills generally clad with vines. Owing to its greater elevation and the retention of the rain-water on its hard surface in the shape of ponds and streams, Morvan shows a mean temperature 6° Fahr. lower than that of the western district, which, in the valley of the Loire, is almost identical with that of Paris, (62° Fahr.) At Nevers the annual rainfall amounts to only eighteen inches; but in Morvan it is about three times as great.

The area of the department is 2,631 miles, one-half being arable land, a third woods, and a tenth pasture, while forty-two square miles are occupied by vines. The vintage of 1881 yielded 5,304,816 gallons of wine—the best wines of Pouilly, a locality which besides sends a great quantity of its grapes to Paris for table use. The Nièvre forests, consisting of oak, beech, hornbeam, and elm, supply about three-fifths of the firewood required for the Parisian market. The coal field of Decize, with its seven seams making a total thickness of forty feet, yielded 200,000 tons in 1888. The pop. (1901) of the department is 319,506. Nièvre is divided into 4 arrondissements, 25 cantons, 313 communes. It forms the diocese of Nevers, and part of the districts dependent on the *corps d'armée* and the court of appeal of Bourges. The chief towns of the arrondissements are Nevers, Château Chinon (2,613 inhabitants), Clamecy (5,536), and Cosne (7,401). Other places of note are La Charité (4,826), with an old church of the order of Cluny; Decize (3,927), with an old church and interesting ruins; and St. Pierre le Moutier (3,080), having an old Cluniac monastery.

NIEZHIN, NIEJIN, or NYEZHIN, a district town of Russia, situated in the government of Tchernigoff, fifty miles southeast of that town, on the railway between Kursk and Kieff. The old town is built on the left bank of the (canalized) river Oster, and its suburbs, Novoye Miesto and Magherki, on the right. In 1898, the inhabitants, mostly Little Russians and Jews, were 32,108.

NIGER, one of the most famous of African rivers, has its headwaters on the north side of the mountains (known as Kong Mountains and by various other local names) which run parallel with the coast of Upper Guinea and Sierra Leone at a distance of about 200 miles, flows northeastward as far as 17° 30' N. latitude and the meridian of Greenwich, and then turning south-eastward reaches the Gulf of Guinea after a total course of about 2,600 miles. The main stream bears in different districts a great variety of names—Joliba (Dholiba or Dialiba), Kworra (Quorra), Mayo, Kaki 'n ruwa, etc.; and the same is true of the great eastern confluent, Benue, Shary or Tchadda.

As a highway of commerce the Niger has been little used, trading steamers having mainly confined their operations to the river below the confluence. But since 1857 the area of supply has been considerably extended, the quantity of goods (chiefly oil and shea butter) collected has greatly increased, and steamers five or six times the size of the vessels formerly used have been introduced. The delta region has become more populous, and trading posts more frequent. The Church Missionary Society, which, except the British Government, has done more than any other agency for opening up the lower Niger, has stations at four places on the coast, at Osamare (120 miles inland), Onitsha (twenty miles farther), Lokoja (ninety miles), Kipo Hill, Egan (ninety miles), Shonga (ninety-four miles farther, and only twelve or fifteen short of Rabba). Lokoja is near

the site of the experimental farm maintained by the government for some years from 1841.

NIGER, C. PESCENNIUS, governor of Syria under the emperor Commodus, and one of the rivals of Septimius Severus for the succession after the murder of Pertinax, belonged to an Aquinum family of equestrian rank, and owed his promotion to the Syrian command not only to the interest of Narcissus, the favorite of Commodus, but also to his known merits as a soldier. He was saluted emperor by the troops at Antioch as soon as the death of Pertinax became known, in the spring of 193 A.D., but he unaccountably delayed marching on Rome until he learned that Severus had assumed the offensive. He now strongly garrisoned Byzantium as well as the principal towns of Asia Minor, but after his legate Æmilianus had been defeated and slain near Cyzicus he himself was driven from Nicæa and decisively routed, with great slaughter, in the neighborhood of the Cilician Gates. Having failed in an effort to escape toward the Euphrates, he was brought back and put to death in 194.

NIGHTINGALE (Anglo-Saxon, *Nihtegale*, literally "singer of the night"), the bird justly celebrated beyond all others by European writers for the admirable vocal powers which, during some weeks after its return from its winter quarters in the south, it exercises at all hours of the day and night. In great contrast to the Nightingale's preëminent voice is the inconspicuous coloration of its plumage, which is alike in both sexes, and is of a reddish-brown above and dull grayish-white beneath, the breast being rather darker, and the rufous tail showing the only bright tint. On the cocks being joined by their partners, the work for which the long and hazardous journey of both has been undertaken is speedily begun, and before long the nest is completed. This is of a rather uncommon kind, being placed on or near the ground, the outworks consisting chiefly of a great number of dead leaves ingeniously applied together so that the plane of each is mostly vertical. In the midst of the mass is wrought a deep, cup-like hollow, neatly lined with fibrous roots, but the whole is so loosely constructed, and depends for lateral support so much on the stems of the plants, among which it is generally built, that a very slight touch disturbs its beautiful arrangement. Herein from four to six eggs of a deep olive color are duly laid, and the young hatched. Toward the end of summer the Nightingale disappears, and but little has been observed of it in its winter retreats, which are presumably in the interior of Africa. One of the few records of it at that season proves that it visits the Gold Coast.

The Nightingale is the *Motacilla lusciniæ* in part of Linnæus, and the *Daulias lusciniæ* of some modern ornithologists.

NIGHTSHADE, a general term for the genus of plants known to botanists as *Solanum*. The species to which the name of Nightshade is commonly given in England is the *Solanum Dulcamara*, L., which is also called the Bittersweet or Woody Nightshade. It is a common plant in damp hedgebanks and thickets, scrambling over underwood and hedges. It has slender slightly woody stems, with alternate lanceolate leaves more or less cordate and auriculate at the base. The flowers are arranged in drooping cymes, and resemble those of the potato in shape, although much smaller. The corolla is rotate, of lilac-blue color with a green spot at the base of each segment, and is furnished with yellow sessile anthers united at their margins so as to form a cone in the center of the corolla. The flowers are succeeded by ovate scarlet berries, which in large doses appear to be poisonous or, to say the least, dangerous to children, cases of poisoning by them hav-

ing occurred. The plant derives its names of bitter-sweet and *Dulcamara* from the fact that its taste is at first pleasantly sweet and then bitter. The young stems collected in autumn have been used in medicine as an alterative in rheumatism and certain skin diseases, but are little used at the present time except by homœopaths, by whom *Dulcamara* is given as an anticatarrhal remedy in all symptoms produced by cold arising from exposure to damp. It owes its medicinal activity to a bitter principle yielding by decomposition sugar and the alkaloid "solania." This principle has been found in small quantity in the leaves, stalks, and berries. *Dulcamara* also contains another glucoside "dulcamarin," which when boiled with dilute acid splits up into sugar and "dulcamaretin." The term Deadly Nightshade is often erroneously applied to this plant, and the popular usage has even been confirmed by so eminent a botanist as Bentham. It is generally accepted, however, that the deadly nightshade is *Atropa Belladonna*, L.

Solanum Dulcamara is subject to the same parasitic fungus (*Peronospora infestans*) as the potato, and may serve as a medium for communicating the spores to the potato if not removed from the hedges of the fields where potatoes are grown.

The Garden Nightshade, *Solanum nigrum*, L., differs from *S. Dulcamara* in having white flowers in small umbels and globose black berries. It is a common weed in gardens and waste places, growing about twelve or eighteen inches high, and has ovate, entire or sinuate-dentate leaves.

The name of Nightshade is applied to plants of different genera in other countries. American Nightshade is a species of *Phytolacca*, the Three-leaved Nightshade is a *Trillium*; the Malabar Nightshade is a *Basella*; the Bastard Nightshade is a *Rivina*; and the Enchanter's Nightshade is *Circea luteiana*. The last-named is not known to possess any poisonous property, and the name seems to have been given to it in the first place in mistake for a species of *Mandragora* (see MANDRAKE).

NIGRITIA. See SOUDAN.

NIIGATA, a city of Japan, with a population in 1898 of 53,360, the chief town of the province of Echigo, and one of the ports open to foreign trade since 1869, lies on the west coast of the island of Nippon, on a narrow strip of sandy ground between the left bank of the Shinano and the sea, which though quite at hand is shut out from view by a low range of sandhills.

NIJAR, a town of Spain in the province of Almería, fourteen miles to the east-northeast of that town, occupies an exposed site on the southern slope of the Sierra Alhamilla. The population of the ayuntamiento in 1898 was 16,661.

NIJNE-TAGHILSK, currently known as TAGHIL, a town and iron-work of Russia, situated in the government of Perm and district of Verkhoturie, 100 miles to the southeast of the district town. Nijne-Taghilsk is a central foundry for a number of iron-mines and eleven other works scattered in the valley of the Taghil and its tributary, the Salda.

NIJNE-TCHIRSKAYA, a Cossack village, or stanitsa, of Russia, chief town of the Second Don district of the Don Cossack government, is situated on the right bank of the Don, at its junction with the Tchir, twenty-five miles below the Kalatch station of the Volga and Don Railway, and is the chief point for corn and linseed from the basin of the middle Don. Its 14,000 inhabitants (with the 11,000 of Verkhne-Tchirskaya, two miles distant) are mostly engaged in agriculture and cattle-raising, favored by the extensive land-holdings (about 700,000 acres) belonging to the Cossacks of both stanitsas.

NIJNI-LOMOFF, a district town of Russia, in the

government of Penza, sixty-nine miles west-northwest from the capital of the government, on the Lomoff; the railway from Penza to Tula passes within seventeen miles.

NIJNI-NOVGOROD, or NIJNIY-NOVGOROD, a government of Central Russia, bounded by Vladimir on the west, by Yaroslaff and Vyatka on the north and northeast, by Kazan and Simbirsk on the east, and by Penza and Tamboff on the south, with an area of 19,800 square miles, two-thirds being on the right and the rest on the left bank of the Volga. The climate is severe, especially in Zavolje, where the average yearly temperature is 5.6° Fahr. lower than at Nijni. The population in 1898 reached 1,600,304; they are mostly Great Russians, Mordvinians (50,600), and Tartars (42,650); the Tcheremisses numbered 5,630, and the Jews about 1,500.

The chief occupation of the inhabitants is agriculture, but only 38 per cent. of the area is under crops. The government is divided into eleven districts, having as their chief towns Nijni-Novgorod (95,124 inhabitants), Ardatoff (3,500), Arzamas (10,500), Balakhna (4,000), Gorbatoff (3,000), Knyaghinin (2,500), Lukoyanoff (10,000), Makarieff (2,000), Semenoff (3,000), Sergach (4,000), and Vasilursk (3,000).

NIJNI-NOVGOROD, or simply NIJNI or NIJNIY, capital of the above government, is situated at the confluence of the Oka and Volga, 276 miles by rail to the east of Moscow. It occupies a most advantageous position on the great artery of Russian trade, at a place where the manufactured and agricultural products of the basin of the Oka meet with the metal wares from that of the Kama, the corn and salt brought from the southeastern provinces, the produce of the Caspian fisheries, and the various wares imported from Siberia, Central Asia, Caucasus, and Persia. It has thus become the seat of the great Makarievskaya fair, and one of the chief commercial centers of Russia.

The town had in 1898 a population of 95,124 inhabitants, rising to 250,000 or perhaps to 300,000 during the fair. The inhabitants are nearly all Great Russians, and many of them are Nonconformists. The mortality exceeds the birth-rate. The educational institutions, which are few, include, besides the military school, one college (gymnasium) for boys and one for girls, a technical school, a theological seminary, two schools for sons and daughters of the clergy, and a dozen primary schools. The aggregate number of scholars being 3,000, nearly 8,000 children receive no public instruction. There is a small public library, and a single periodical, *The Exchange News*; the five printing-offices are employed almost exclusively by the public institutions. Of late the statistical committee has issued a most valuable publication, the *Nijegorodskiy Shornik*, containing all kinds of statistical, ethnographical and archaeological information about the government.

NIKKO, one of the chief religious centers of Japan, is beautifully situated on Nikko Zan (Mountains of the Sun's Brightness) in Tochigi ken (province of Shimotsuke), about ninety-two miles north-northwest of Tokio (Yedo) by the ordinary route via Utsunomiya. The town is properly called Hachi-ishi, but this name is very little used in comparison with that of the shrines. From 1644 to 1868 the "abbots" of Nikko were always princes of the imperial blood; thirteen of them are buried within the sacred grounds. Though the magnificent abbots' residence was destroyed by fire in 1861, and the temples have lost most of their ritual and much of their material splendor, enough remains to astonish by excellence and bewilder by variety of decorative detail.

NIKOLAIEFF, the chief naval station of Russia

on the Black Sea, is situated in the government of Kherson, forty-one miles northwest of the government capital. It stands most advantageously a little above the junction of the Ingul with the Bug, at the head of the *liman*, or estuary, of the Bug, and is the natural outlet for the basin of that river. The estuary, which is twenty-three miles long, enters that of the Dnieper; and Nikolaieff, forty-two miles distant from the Black Sea, thus combines the advantages of a good seaport with those of an inland town. The entrance to the double estuary of the Bug and Dnieper is protected by the fortress of Otchakoff and by the fort of Kinburn, erected on a narrow headland opposite, while several forts surround Nikolaieff on both sides of the Bug and protect it from an attack by land. The town, which occupies two flat peninsulas between the Bug and the Ingul, extends up the banks of the latter, while its suburbs spread still farther into the steppe, the whole covering an area of six square miles. Pop. (1898), 92,060.

NIKOLAIEVSK, a district town of Russia, in the government of Samara, on the right bank of the Irghiz, lies forty-eight miles from the Volga and 109 miles to the southwest of Samara. Its 10,000 inhabitants are mostly Kaskolniks, or of the "United Church," and about 2,000 Tartars occupy a separate part of the town. The chief occupation of the Russian and Tartar inhabitants is agriculture and cattle-breeding, in the products of which the merchants carry on a lively trade.

NIKOLAIEVSKAYA SLOBODA, a village of Russia, in the government of Astrakhan and district of Tsareff, three miles from the Volga, on its left bank, opposite Kamuishin.

NIKOPOL, a town of Russia, in the government and district of Ekaterinoslaff, on the right bank of the Dnieper, seventy-six miles to the south-southwest of Ekaterinoslaff. The town, formerly called Nikitin Rog, occupies an elongated peninsula between two branches of the Dnieper, at a point where its banks are covered on both sides and to a considerable distance with marshes, and has been for many centuries one of the places where the middle Dnieper could most conveniently be crossed.

NIKOPOLI, or NICOPOLI, a city of Bulgaria, the chief town of a circle in the district of Plevna, is picturesquely situated on the south bank of the Danube, at the confluence of the Osma. According to the census of 1897 it had only 4,652 inhabitants.

NILE. This mighty river, which after a course of 3,370 miles pours into the Mediterranean a low-water current of 61,500 cubic feet per second, has its cradle in the Victoria Nyanza, an enormous lake in Central Africa where the line of the equator is crossed by 32°, 33°, and 34° of E. longitude from Greenwich, somewhere about 4,000 feet above the sea.

In 1875 Stanley proved that the only outflow from Victoria Nyanza was by the Ripon Falls on the north side of the lake. These falls (named after Earl de Grey and Ripon, president of the Royal Geographical Society in 1859) were discovered July 28, 1862, by Captain Speke, but from native accounts he was led to believe that other streams (such as the Luajjerri) issued from the lake. The Nile, as it drops about twelve feet over the rocks, has a breadth of 400 to 500 feet, divided into several sections by a number of wooded isles. For the next 300 miles the Victoria Nile or Somerset River, as this section is called, has all the character of a mountain stream racing swiftly along a rocky channel often walled in by cliffs (at times 180 feet high) and broken by picturesque islands and countless rapids. At first for 117 miles its course is north-northwest, but reaching the Khor Kafu (on which Mruli stands), it takes the northeast direction of this channel, and it is not till 2°

N. latitude that it again turns northwest toward the Albert Nyanza. But the great feature of the Victoria Nile is the Murchison Fall, about 2° 18' N. latitude and 31° 50' E. longitude, where the river rages furiously through a rock-bound pass, and plunges at one leap of about 120 feet into a gloomy abyss. Below this point, continuing between steep forest-covered hills, it gradually calms down into a stream so slow and steady that at certain seasons it is only from the scarcely perceptible drifting of the little green water plants, called *Pistia Stratiotes*, that the flow can be observed. About twenty or twenty-five miles below the fall it enters the north end of the Albert Nyanza.

This lake was first reached by Baker on March 14, 1864, near Vacovia, on the east coast, a small village of fishermen and saltmakers. From a granite cliff 1,500 feet above the water, he looked out over a boundless horizon on the south and southwest, and toward the west described, at a distance of fifty or sixty miles, blue mountains about 7,000 feet high. The Albert Nyanza was consequently entered on his map as a vast lake extending from 2° S. latitude to 2° 50' N. latitude, or a distance of about 380 miles. But the circumnavigation of the lake by Gessia Pasha (1876), Mason Bey, and Dr. Emin Bey, leaves no doubt that its real dimensions are—length ninety-seven miles, average breadth twenty-two miles, and area about 2,000 square miles. Instead of the lake being, as Baker contended, one of the great sources of the Nile, its functions are those of a large backwater.

Escaping by an island-studded channel from the northwest corner of the Albert Nyanza, the Nile, which now takes the name of Bahr al-Jebel, or River of the Mountains, continues to flow in a general northward direction.

The great plain which the Nile enters below Lado, about 5° N. latitude, slopes so gradually toward the north that the river falls only 300 feet in a stretch of more than 650 miles between Gondokoro and Khartoum. As the river has gradually raised the level of both bed and banks, an overflow takes place, and lagoons or side-channels are formed wherever the bank breaks down; and as these, from their position, naturally act as settling-ponds, they get rapidly silted up.

Up to about 7° 25' N. latitude, in spite of this condition of things, the Nile maintains a fairly definite course, with a considerable depth of water in its main current, but at this point it splits up into two branches as if to form a delta. The left branch, which retains the name Bahr al-Jebel, but which may be conveniently distinguished by the Denka name of Kir, continues in the line of the river, and the right branch, or Bahr al-Zeráf (Giraffe River), tends rather more toward the east. After flowing respectively about 160 and 140 miles, they reach the Bahr al-Ghazál, slowly gliding east with a slight deflection to the south. The whole region is a vast expanse of low, swampy lands crossed by secondary channels, and flooded for many miles in the rainy season. At the junction of the Bahr al-Ghazál and the Kir the permanently submerged area is usually named Lake No on our maps, but the Arabs simply call it the confluence—Mokren al-Bohúr.

About ninety-five miles below the junction of the Kir, and thirty below that of the Bahr al-Zeráf, the White Nile receives its first great affluent from the east. The Sobát, as it is called, has its headwaters (largely unexplored) distributed over a wide area—the southmost rising possibly as far south as 4° N. latitude in the hilly country of Atuka, the eastmost in Kaffa, and the northmost about 9° in the Berta mountain.

The northward progress of the White Nile for the next 300 miles is through a great plain stretching from

the spurs of the Abyssinian highlands in the east to the hilly districts of Takalla, and Kordofan in the west, and consisting almost exclusively of red and other sandstone, often flat as a pavement. Escaping from the swampy region, the river again forms a well-marked channel, with regular and sometimes high banks. Throughout the whole distance indicated a striking confirmation of Baer's law is afforded—the fairway or deeper side of the stream generally keeping to the eastern shore. About sixty miles below the Sobát mouth lies (on the right bank) Fashoda, an Egyptian town founded in 1867 on the site of Denab, the old "capital" of the Shilluks. In the neighborhood of Mahadat Abu Zaid begin the Sunt Islands, so called from the Arab name for the *Acacia nilotica*, a tree characteristic of the White Nile.

At Khartoum (Khartúm), in $15^{\circ} 37'$ N. latitude, the White Nile is joined by its greatest eastern confluent, the Blue Nile (Bahr el-Azrak). This river has its head reservoir in Lake Tana (Tsana), which is so situated that the lines of 12° N. latitude and $37^{\circ} 2'$ E. longitude cut it into four nearly equal portions. The height of the lake is 5,658 feet (Rohlf's). From east to west the breadth is about forty miles, and the area is estimated at 2,980 square miles. Between Dega and Zegi a depth of 246 feet has been found, and between Korata and Zegi 219. The Blue Nile, or Abai as it is called in Abyssinia, rises on the northward slopes of a cluster of mountains (Mount Gesh, etc.) about 11° N. latitude, and flowing northward enters Lake Tana near the southwest corner, to issue again at no great distance. From east and south and north the mountain streams pour down into the river—its eastmost tributary probably rising east of Magdala, and its southmost between 8° and 9° N. latitude. At Fazoki or Famaka, $11^{\circ} 17'$ N. latitude, it begins to escape from the mountains; about 130 miles farther down, after passing Rosaires and Karkoj on the right and Sennaar on the left, it is joined by the Dinder; and thirty-five miles more bring it to the confluence of the Rahad (Ra'ad) and the town of Abú Haraz. Beyond this point it flows through the most fertile portion of the Egyptian Soudan, the plain on the left hand more especially being a great grain-growing district. The total length of the Abai or Blue Nile may be estimated at 960 miles.

On the northwest side of the mountains which inclose Lake Tana are some of the headwaters of the Atbara, another important tributary of the Nile; but it does not reach the main stream till about 200 miles below Khartoum. Its principal branch, the Settít or Takazze, has a course of about 420 miles through the Abyssinian plateau before it joins or (more strictly) is joined by the river which gives its name to the united stream. The Khor-el-Gash, or Mared, though a considerable river in its upper regions, reaches the Atbara (and thus the Nile, of which it is the northmost affluent) only during a heavy rainy season.

After receiving the Atbara the Nile continues for 650 miles through the Nubian desert, where the volume of the river suffers continual diminution from the extreme dryness of the air, without being recruited by a single drop of water. Between Berber (an important town on the right bank thirty miles below the Atbara) and Wády Halfa (about 600 miles) rapids and cataracts follow at intervals. The highest of these, the fifth cataract of the Nile, is situated about forty miles below Berber; the fourth, 170 miles farther down, below Shitab; the third, 230 miles farther, at Hannek, and the second just above Wády Halfa. At Assuan (200 miles lower) are the first cataracts. Beyond that point the river flows through the wonderful valley which has already been described in the article EGYPT.

NÍLGIRI, a petty state in Orissa, Bengal, India, bounded on the north and west by Morbhanj state and on the south and east by Balasor district, with an area of 278 square miles, of which only one-third is under cultivation. The population in 1901 was 60,000.

NÍLGIRI HILLS, or NEILGHERRY HILLS, a district and range of mountains in the Madras presidency, India. The district until recently consisted exclusively of a mountain plateau lying at an average elevation of 6,500 feet, with an area of about 725 square miles. In 1873 this was increased by the addition of the Ochterlonj valley in the southeast Wainád, and again, in 1877, by other portions of the Wainád, making a total area of 957 square miles. The administrative headquarters is at Utakamand, which is also the summer capital of the government of Madras.

The population of the district in 1901 was about 100,000. The only town with more than 5,000 inhabitants is Utakamand, with a population of 12,335.

NIMÁR, a district in the Central Provinces, India. The area is 3,340 square miles, of which only 659 are under cultivation. The population in 1901 was 231,341 (embracing 199,454 Hindus, 24,426 Mohammedans, 5,282 aborigines—the most numerous tribe of these being the Bhils). Khandwa town is the administrative headquarters.

NIMEGUEN, NIMWEGEN or NYMEGEN, probably the oldest of all the cities of the Netherlands, is situated in the province of Guelderland, on the south bank of the Waal, eighty miles from the sea and seventeen miles northwest of Cleves. Between 1656 and 1679 Nimeguen was the seat of a university; it has now nothing higher than a gymnasium. Tools, gold and silver work, leather, furniture, tobacco, etc., are the chief products of the local industry; and a good deal of traffic is carried on by means of both the river and the railway. The population of the town in 1901 was 44,034; that of the commune increased from 22,929 (15,984 Roman Catholics, 5,806 Dutch Reformed, 408 Jews) in 1875 to 25,000 in 1880.

NÍMES, a city of France, lies 450 miles south-southeast of Paris by the Clermont-Ferrand Railway, and eighty miles northwest of Marseilles. The importance of the place is due to its central position between the Rhone, the Cevennes, and the sea, to the richness of the surrounding district, which before the ravages of the *Phylloxera* was clothed with vines, to its commerce and industry, and lastly to its archaeological treasures. No town in France can show so many remains of the Roman period.

At the close of the Middle Ages the industries of Nimes were raised to a state of great prosperity by a colony from Lombardy and Tuscany. Since then, however, the numbers of this class have hardly increased, while the population of the city has been doubled. The silk manufacture no longer occupies all hands. Upholstery materials, carpets, handkerchiefs, tapes, braidings, hosiery, leather, clothes, and boots and shoes are also produced; and, coal being worked in the neighborhood, a number of foundries have been established. Nimes is, besides, one of the great southern markets for wine and brandy, silks and cocoons; and there is a good trade in grain, groceries, and colonial wares. The population of the city in 1901 was 80,355; that of the commune was 62,394 in 1871, and 63,552 in 1881.

NIMROD, apart from the mere mention of his name in Micah v. 5, occurs only once in Scripture, namely, in Gen. x. 8-12, where, in a Jehovistic portion of the genealogy of the nations there given, we are told that "Cush begat Nimrod, who was the first mighty one in the earth (he was a mighty hunter before Jehovah,

wherefore it is said—A mighty hunter before Jehovah even as Nimrod), and the beginning of his kingdom was Babel, and Erech and Accad, and Calneh in the land of Shinar. Out of that land he went forth into Asshur and builded Nineveh," etc. Just as Enos was the first to call upon the name of Jehovah, and Noah the first to plant vines, so is Nimrod the first mighty ruler in the earth, and as such at the same time a mighty hunter before Jehovah, after the manner of the Oriental sovereigns of old. By the Hebrews the Assyrio-Babylonian empire was at all periods regarded as the prototype of the worldly power; and it is of this kingdom that Nimrod here figures as the founder—not in its prehistorical but in its historical form as actually subsisting at the time of the writer. This is apparent, not only from the general character of the genealogical table, but also from the enumeration of the cities in the land of Shinar and Asshur. As founder of the kingdom, Nimrod represents both kingdom and people; the genealogy knows no distinction between the hero and the nation—the latter is the family of the former. When, therefore, Nimrod is said to be descended from Cush, the mighty nation of Asshur and Babel (which in Gen. x. 22 is regarded as belonging to Shem) is also by the Jehovah assigned to Cush.

NINEVEH, the famous capital of the Assyrian empire, called Ninua or Ninà on the monuments. Though the city appears to have been entirely destroyed in the fall of the empire the name of Nineveh continued, even in the Middle Ages, to be applied to a site opposite Mosul on the east bank of the Tigris, where gigantic *tells* or artificial mounds, and the traces of an ancient city wall, bore evident witness of fallen greatness. The walls inclose an irregular trapezium, stretching in length about two and one-half miles along the Tigris, which protected the city on the west. The greatest breadth is over a mile. The most elaborate defenses, consisting of outworks and moats that can still be traced, were on the southern half of the east side, for the deep, sluggish Khausar, which protects the northern half of this face, then bends around toward the Tigris, and flows through the middle of the town, so as to leave the southeast of the city more open to attack than any other part. The principal ruin mounds within the walls are that of Kuyunjik, north of Khausar, and that of the prophet Jonah (Nebi Yûnus) south of that stream. The latter is the traditional site of Jonah's preaching, and is crowned by an ancient and famous Mohammedan shrine. The systematic exploration of these ruins is mainly due to Layard (1845-46), whose work has been continued by subsequent diggers. These researches leave no doubt as to the correctness of the local tradition. Not only have magnificent remains of Assyrian architecture and sculpture been laid bare, but the accompanying cuneiform inscriptions throw much light on the history of the city and its buildings.

NING-PO, or NING-PO-FOO (*i.e.*, City of the Hospitable Waves), a great city of China, one of the five seaports thrown open to foreign trade in 1842 by the treaty of Nanking, and the principal emporium of the province of Chekeang, stands in a plain bounded by mountains toward the west, on the left bank of the Takia or Ning-po river, about sixteen miles from its mouth. It is surrounded by a fine old wall, twenty-five feet high and sixteen feet broad, pierced by six gates and two passages for ships in its circuit of four to five miles. As is natural in a place long celebrated for its religious and educational préminence, there is no lack of temples, monasteries, and colleges, but few of these are of any architectural significance. Brick is the ordinary building material, and the dwelling-houses are mostly of one story. Silks, cottons, carpets, furniture,

whitewood carvings, and straw hats are the chief products of the local industry. Large saltworks are carried on in the vicinity, and thousands of fishermen are engaged in catching the cuttle-fish. In spite of the powerful competition of Shanghai, Ning-po has a valuable foreign trade. It is regularly visited by the vessels of the China Navigation Company and the Chinese Merchants Steam Navigation Company. From 216,191 register tons in 1873 the tonnage of the port has increased to 303,109. The principal import is opium. Lead for packing tea was formerly a leading item, but it now enters mainly by other ports. After the storming of Chinhai—the fortified town at the mouth of the river—on October 10, 1841, the British forces quietly took possession of Ning-po on the 12th. In 1864 the Taipings held the town for six months. Missions are maintained in Ning-po by the Romish Church, by the Church Missionary Society (1848), the American Presbyterians, the Reformed Wesleyans, the China Inland Mission (1857), etc. A mission hospital was instituted in 1843. The population of the city and suburbs was estimated in 1900 at 255,000.

NINIAN (NINIANUS or NYNIAS), St., was, according to the earliest account of him we possess—that of Bede—a bishop of the nation of the Britons who had been trained at Rome in the doctrine and discipline of the Western Church, and who built at Leukopibia (a town of Ptolemy's Novante, on the west side of Wigtown Bay, the modern Whithorn) a stone church, called Candida Casa, dedicated to St. Martin of Tours. He is said to have converted the Picts to the south of the Grampians. An old Irish account mentions that he spent his last years in Ireland, where he founded a church in Leinster.

NIOBE is a figure who appears in the legends of many parts of Greece, especially Thebes, Argos, and the Hermus valley. Proud of her numerous family, she scoffed at Leto as the mother of only two children, Apollo and Artemis, the children of Leto, slew all her children with their arrows; and Niobe, after vainly trying to defend them, wept over them till she became a rock which still weeps incessantly.

NIOBIUM, a very rare chemical element which was discovered by H. Rose, in 1846, as a component of the columbite of Bodenmais. In it, as also in tantalite, pyrochlore, ytthro-tantalite, and a few other rare minerals, it is constantly associated with tantalum, which was discovered by Ekkeberg, in 1802. Both metals, with vanadium, form a kind of appendage to the nitrogen group of elements. Like these they are capable of forming acid pentoxides and corresponding chlorides and oxychlorides.

NIORT, a city of France, chief town of the department of Deux Sèvres, distant 255 miles southwest of Paris, by the railway to Poitiers and La Rochelle (here crossed by the line from Angers to Angoulême), is situated at the head of navigation of the Sèvre Niortaise, partly in the valley and partly on the slopes of the inclosing hills. The population of the city is 18,823, and that of the commune 22,254.

NIPPON. See JAPAN.

NISH, NISCH, or NISSA, the ancient Naissus, a city of the Balkan peninsula, which at one time was the capital of Serbia, and after being the chief town of a Turkish eyalet in the vilayet of the Danube, and (1877) of the new vilayet of Kossovo, was again, in 1878, restored to Serbia, where it is now the administrative center of a circle containing a population of 117,000. The town is a thriving place of 12,800 inhabitants, the see of a Greek bishop, the headquarters of a militia corps, and an important center in the Serbian railway system.

NÍSHÁPÚR, or **NÉSHÁPÚR**, the most important city of Khorásán in the Middle Ages, but now much decayed. The second element of the name is that of the traditional founder, Shahpuhr or Sapor. Some accounts name the first, others the second Sapor. The older name of the town or district was Abrashahr. The importance of the place under the Susaniens was in part religious; one of the three holiest fire-temples was in its neighborhood. Nishápúr under the Moslems contained a large Arab element; it became the capital of Khorásán, and greatly increased in prosperity, under the almost independent princes of the house of Táhir, (826-873 A.D.)

NISIBIS, a once famous city and fortress, situated in the north of Mesopotamia, near the point where the Jaghjagha leaves the mountains by a narrow defile. The modern Nasibín consists of some 200 wretched huts, mainly inhabited by Jews, who pay tribute to the Shammar Bedouins.

NISI PRIUS. For the history and meaning of this term in English law see **ASSIZE**. As a rule actions only are tried at *nisi prius*, and a judge is said to sit at *nisi prius* when he sits alone, usually in the Queen's Bench Division, for the trial of actions.

NISSA. See **NISH**.

NITRATES, NITER, NITRIC ACID. See **NITROGEN**.

NITROGEN is a chemical element which, on account of its abundance in nature and its relations to life, is of great importance. About three-fourths of the mass of the atmosphere consists of elementary nitrogen; and, as an essential component of all albuminoids, the element pervades the whole of the animal kingdom. Nitrogen minerals are scarce (almost the only ones are Chili saltpeter and native niter), but traces of the two nitrogen compounds, ammonia and nitric acid, are diffused throughout all soils, besides existing in the atmosphere.

Elementary nitrogen exists only in the one form of nitrogen gas ($N_2 = 1$ molecule), which is easily extracted from the atmosphere. Though resembling air in its general properties, it is easily distinguished from it by its not supporting combustion.

Chemically, nitrogen gas is characterized by perfect inertness toward all ordinary reagents under ordinary conditions. But at certain higher temperatures boron, magnesium, vanadium, and titanium combine with it directly into nitrides. Nitrogen is capable of uniting even with ordinary oxygen. A mixture of the two gases, it is true, remains unchanged when exposed *en masse* to any temperature, but when it is subjected to a succession of electric sparks a small proportion of the two gases does unite into nitric oxide, which then combines with more oxygen into red fumes of peroxide.

The part which the nitrogen gas in the atmosphere plays in the economy of nature is as yet a mystery. It certainly is not susceptible of being taken up directly by the plants and utilized in their synthesis of nitrogenous compounds. It plays no active part in the processes of combustion and of animal respiration; in either it appears to act only as an inert diluent of the oxygen.

In the case of respiration, however, this particular diluent seems to be essential; no animal could live healthily for any considerable period of time in pure oxygen, and we know of no other diluent which could be substituted for the nitrogen without producing poisonous effects. There can be no doubt that atmospheric nitrogen, in an indirect way, contributes toward the building up of nitrogenous organic matter. Every process of ordinary combustion probably, and every electric discharge in the atmosphere certainly, induces the formation of some nitric acid, which by combining with

the atmospheric ammonia becomes nitrate of ammonia, and from certain experiments of Schönbein's it would appear that nitrogen gas and water are capable of uniting directly into nitrate of ammonia, which, supposing it to be produced in the atmosphere, would promptly be oxidized into nitrate. The nitrate produced by either process is carried down by the rain and conveyed to the roots of the plants, which assimilate it as a part of their nitrogenous organic matter. However small the scale may appear on which these processes of atmospheric nitrification go on when measured by the mass of nitrogen which remains unchanged, as this mass is immense, their absolute effect must be very considerable, and may form an important item in the economy of nature.

The compounds of nitrogen may be arranged under the heads of ammonia, nitrates, nitro-compounds, organic nitrogen compounds, and cyanides.

Ammonia, the only known compound of hydrogen, is a gas of the molecular formula NH_3 . The most convenient process for the preparation of the pure gas is to mix powdered sal-ammoniac with powdered quicklime in a flask and to heat the mixture in a sand-bath. Torrents of ammonia come off, which must be dried by passing it through a closely packed column of solid caustic potash or soda (chloride of calcium absorbs the gas chemically) and collected over mercury, as the gas dissolves most abundantly in water.

Aqueous ammonia (liquor ammoniæ), being in constant requisition as a reagent, and also used in medicine and in the arts, is being manufactured industrially. Aqueous ammonia is generally sent out as a "liquor fortissimus" of 30 to 35 per cent. For ordinary laboratory purposes it is usually diluted down to 9 to 10 per cent.

Two natural sources of ammonia are at present in industrial use. The gaseous exhalations of volcanoes always include ammonia, hydrochloric acid, and sulphurous acid, of which the first two are formed, no doubt, by the action of steam on deposits of nitrides and chlorides in the interior of the earth. This volcanic ammonia salt is highly valued as a material for the preparation of pure liquor ammoniæ; but its supply hardly comes up to the demands of even this small industry. More important are the masses of ammonia formed in the processes of putrefaction which are going on constantly in nature, and of which a mere fraction would satisfy all the demands of industry, if the recovery of such ammonia were not, as a rule, beset with insuperable difficulties. Thus, for instance, all the immense mass of the ammonia of the sewage of our large cities must be allowed to go to waste because we have no economical method for its extraction. Urine, when undiluted, is an easily handled raw material, and in former times actually formed the principal source of ammonia. Human urine contains from 2 to 3 per cent. of urea, or carbamide as it is called in systematic chemistry, because it is the anhydride of carbonate of ammonia. When urine putrefies, this carbamide takes up the elements of water and becomes carbonate of ammonia. A prompter mode of conversion is to evaporate the urine with a small proportion of vitriol, and heat the residue to near the boiling-point of the acid, when the nitrogen of the urea passes at once into the form of sulphate of ammonia. This latter process would apply also to the urine of horses and cattle, which, instead of urea, contain hippuric acid, a compound which, when taken conjointly with water, contains the elements of ammonia and benzoic and acetic acids. At the present time urine plays hardly any part in the ammonia industry; but it may be mentioned that the produce of the urinals of Glasgow is, or lately was, wrought for carbonate of ammonia.

Large quantities of tar-water are produced incidentally in the manufacture of coal-gas, and it is this material which at present forms the principal source for the industrial production of ammonia and ammonia salts. The tar-water obtained as a by-product in the distillation of shale for the production of paraffin oil is rich in ammonia, and is worked up for sulphate like gas-liquors.

Crude tar-water contains about 1 per cent. of ammonia (more or less according to the quality of coal used, and the way it has been manipulated), mostly in the form of carbonate, part as cyanide, sulphocyanate, and sulphide of ammonium; and this ammonia is associated with traces of hydrocarbons and other organic matter dissolved, or suspended, in the liquor. In some establishments the ammonia is extracted directly in the form of liquor ammoniac. The liquor is run into a large iron boiler, and, after addition of some ferrous and ferric salt, mixed with slaked lime and distilled. The vapors, if condensed as they come off, would yield a very dilute liquor and contaminated largely with volatile carbon compounds. To obtain a relatively pure gas, the vapor is subjected to a succession of partial condensations by making it pass through the several compartments of an iron apparatus similar in its action to the "Coffey's still" which is used for the strengthening and refining of alcoholic liquors (see DISTILLATION).

Of the several ammonia compounds, the sulphate is by far the most important in an industrial sense. Immense quantities of the crude salt are used as a manure—while to the technical chemist generally it serves as the most convenient starting-point for the manufacture of ammonia, or of other ammonia salts.

Nitrate of potash (saltpeter), which forms the predominating component of gunpowder, occurs native in India and other parts of the world, and such native niter has only to be purified by crystallization to become fit for the market. But the bulk of what occurs in commerce is made by double decomposition of Chili saltpeter with caustic potash, carbonate of potash, or chloride of potassium, which processes yield caustic soda, carbonate of soda, common salt as by-products. The third form of the method is most largely wrought, the necessary supplies of cheap chloride of potassium being furnished by the works at the Stassfurt deposits. A mixture of niter with charcoal, sulphur, or other combustible matter, when kindled, burns off with explosive violence. Hence its application for the manufacture of gunpowder and in pyrotechnics, and its use in the laboratory as a powerful oxidizing agent in operations of the dry way.

Nitric Acid, HNO_3 , is prepared from nitrate of potash or soda by distillation with sulphuric acid. The scientific chemist prefers the potash salt because it is more easily purified; the manufacturer uses nitrate of soda because it is cheaper and a lower temperature and a less excess of oil of vitriol suffice for its successful conversion into acid.

NITROGLYCERINE (synonyms *Glonoïn*, *Glonoïn Oil*, *Dynamites*, *Blasting Gelatine*), was discovered by Sobrero in 1846, and soon afterward was more thoroughly investigated by Railton and by De Vrij. It is formed by the action of concentrated nitric acid, in the presence of strong sulphuric acid, upon glycerine at a low temperature, and may be readily prepared upon a small scale by dropping the glycerine into the mixed acids, the mixture being kept artificially cooled, and afterward poured into a large volume of water. The nitroglycerine then separates as a heavy liquid, generally pale yellow, but quite colorless when pure. It is inodorous, and has a sweet, pungent, a.o.n.aic flavor; if it be touched with the tongue or even brought into

contact with the skin severe headache ensues, but this effect does not recur after awhile with those who habitually handle it, nor is their health permanently injured by working with it. Nitroglycerine is applied medicinally, in very minute doses, in cases of heart disease, but if taken even in small quantities it operates as a violent irritant poison. If a thin layer be spread upon a hard surface and struck sharply with a hammer it explodes violently; under favorable conditions it is more sensitive to explosion by a blow than even mercuric fulminate. It freezes (or crystallizes, in six-sided prisms) at about 40°F. , and slowly liquefies again at 50° . When frozen it is less sensitive to explosion; in the United States, where nitroglycerine is extensively used, as such, in mining operations, it is transported in the frozen state for greater safety. Under some circumstances, however, the readiness with which nitroglycerine and its preparations freeze is a source of danger; they have generally to be thawed, by applying heat, before use in cold weather or after they have been frozen for some time, and disastrous explosions have resulted from this being carelessly done. Nitroglycerine is very slightly soluble in water, but is readily taken up by many solvents, especially by methyl-alcohol or wood-spirit. This solution being non-explosive, in the early days of application of nitroglycerine it was transported in that form; but if the spirit became weakened by evaporation, an explosive layer of nitroglycerine containing some spirit would separate, and, in cold weather, nitroglycerine would crystallize out of the solution. The dangers attending the use of nitroglycerine were therefore not much diminished by the use of the solvent.

Unless very carefully freed from acid and from unstable impurities, nitroglycerine will decompose more or less rapidly, especially in warm climates, and the heat developed by the chemical change may lead to spontaneous explosions. But, when manufactured and purified according to the system originated and developed by Nobel, the liquid is possessed of great stability.

The first attempts to utilize the explosive power of nitroglycerine were made by Nobel in 1863; they were only partially successful until the plan, first applied by General Pictot in 1854, of developing the force of gunpowder in the most rapid manner and to the maximum extent, through the agency of an initiative detonation (see EXPLOSIVES), was applied by Nobel to the explosion of nitroglycerine. Even then, however, the liquid nature of the substance, though advantageous in one or two directions, constituted a serious obstacle to its safe transport and storage and to its efficient employment; it was therefore not until Nobel hit upon the expedient of producing plastic solid preparations by mixing the liquid with solid substances, in a fine state of division, capable of absorbing and retaining considerable quantities of it, that the future of nitroglycerine as one of the most effective and convenient blasting agents was secured. Charcoal was the first absorbent used; eventually the siliceous (infusorial) earth known as "kieselguhr" was selected by Nobel as the best material for producing DYNAMITE (*q.v.*), as it absorbs, after calcination, from three to four times its weight of nitroglycerine, and does not part with it easily when the mixture is submitted to pressure or frequent alterations of temperature. For work requiring the greatest sharpness and violence of action, the so-called No. 1 dynamite, consisting of about seventy-five parts of nitroglycerine and twenty-five parts of kieselguhr, is by far the most extensively used; other inert absorbents have been used at times, and numerous other less violent forms of dynamite are prepared by impregnating mixtures of oxidizable substances and oxidizing agents (*e.g.*, of nitrates and charcoal or carbonaceous bodies) with smaller pro-

portions of nitroglycerine, or by using imperfectly nitrified wood-fiber, or other forms of cellulose, as the absorbent. *Lithofracteur*, *dualin*, *glyoxilin*, *potentite*, *atlas-dynamite*, *liquin-dynamite*, are examples. The last-named was employed by the Fenians in the attempted outrages in Glasgow and London in 1883. The only inert absorbent of nitroglycerine which compares in efficiency with kieselguhr is *magnesia alba*, which is extensively used for making dynamite in California. The application of nitroglycerine preparations to industrial purposes, especially for mining, tunneling, and blasting work in which great cleaving and shattering effects are desired, has developed very rapidly since 1867. The most recent and most perfect form in which nitroglycerine is now used is called *blasting gelatine*. This material, also invented by Nobel, is composed of the liquid and of a small proportion of so-called nitro-cotton, which consists chiefly of those products of the action of nitric acid on cellulose which are intermediate between colodion-cotton and gun-cotton, (trinitro-cellulose, etc.) If the liquid is gently heated together with 5 to 7 per cent. of the finely-divided nitro-cotton, and the mixture kept stirred, the two gelatinize together, producing a translucent, plastic, and tenacious mass, which becomes hard when cooled to the freezing point of nitroglycerine, and may be kept in water for any length of time without an appreciable separation of nitroglycerine. When properly prepared, blasting gelatine is less sensitive to detonation than dynamite; and, while its action as an explosive is somewhat more gradual, it is considerably superior to dynamite in explosive power, and even slightly more powerful than pure nitroglycerine, the reason being that the latter contains somewhat more oxygen than is required for the complete oxidation of the carbon and hydrogen, and that this excess is utilized in supplying the deficiency of oxygen existing in the feebly explosive nitro-cotton. Blasting gelatine is rapidly replacing dynamite in some of its applications, and is already extensively manufactured in different countries.

NITZSCH, KARL IMMANUEL, theologian, was born at the small Saxon town of Borna on September 21, 1787, and died in 1868.

NIVELLES (Flem., *Nyvel*), a manufacturing town of South Brabant, Belgium, stands on the Thines, a small sub-tributary of the Scheldt, eighteen miles by rail to the south of Brussels. Population (1900), about 12,000.

NIZAMI. Shaikh Nizâmî or Nizâm-uddîn Abû Mohammed Ilyâs bin Yûsuf, the unrivaled master of the romantic epopee in Persia, who ranks in poetical genius as next to Firdausî, was born 535 A.H. (1141 A.D.) His claim to the title of the foremost Persian romanticist he fully established by the publication of his first epic masterpiece, *Khosrau and Shîrin*, composed, according to the oldest copies, in 576 A.H. (1180 A.D.).

NIZAM'S DOMINIONS. See HYDERABAD.

NOAH is, according to the book of Genesis, the son of Lamech, and the second father of mankind after the deluge. His name, which is of obscure origin, is connected in Gen. v. 29 with a play on the word *nahe*, to comfort. The story of the flood, the two elements of which the extant narrative is composed, and the parallel traditions of other nations, particularly of the Babylonians, have been spoken of in the article DELUGE. The earlier narrative does not mention the point at which Noah left the ark, and it is doubtful if Gen. xi. 1 sq., which seems to be a fragment of a still older tradition, and which makes mankind disperse from Babylonia, originally stood in any connection with the story of Noah and the flood. The later priestly (or, as it used to be called, Elohistic) narrative names the mountains of Ararat, i.e., one of the mountains of the land of

Ararat, as the place where the ark rested. The identification of this mountain with the Ararat of modern maps (M. Masis) is tolerably old; Jerome already places the land of Ararat in this quarter; but a more ancient Jewish tradition, which remained alive throughout the Middle Ages, seeks Ararat in the land of Kardu, i.e., the mountains of the Kurds east of the Tigris (comp. ARARAT). From the Bible it is only certain that the kingdom of Ararat was a remote northern district. After describing the covenant which God made with Noah on leaving the ark the priestly narrative has nothing further to tell of the patriarch's life; but an older fragment makes him plant a vineyard and drink of the wine with consequences which lead him to pronounce a blessing on Shem and Japheth and a curse of slavery on Canaan. The story seems to require, for clearness, the omission of the words "Ham, the father of" in verse 22; and if this be so we find that in one tradition the sons of Noah are Shem, Japheth, and Canaan. So taken, the names of the three sons would represent three elements, not in the population of the world, but in that of Palestine. Shem, in Hebrew, means name, and "sons of name," as opposed to "sons of no name," would naturally denote the Hebrew pure-blooded aristocracy, in antithesis to the subject aborigines (Canaan).

NOAILLES. This great French family took its name from the castle of Noailles, in the territory of Ayen, between Brives and Turenne, in Limousin, and dated its nobility from the eleventh century. It did not obtain more than local and provincial fame until the sixteenth century, when its head, Antoine de Noailles (1504-1562), became admiral of France, and was ambassador in England during three important years, 1553-1556, during which he maintained a gallant but unsuccessful rivalry with the Spanish ambassador, Simon Renard. Henri (1554-1623), son of Antoine, was a commander in the religious wars, and was made comte d'Ayen by Henry IV. in 1593. The grandson of the first count played an important part in the Fronde and the early years of the reign of Louis XIV., became a captain-general of the newly-won province of Roussillon, and in 1663 was made duc d'Ayen, and peer of France. The sons of the first duke raised the family to its greatest fame, and occupied very important positions in the later years of the reign of Louis XIV. The elder son of Anne Jules (1650-1708), was one of the chief generals of France toward the end of the reign of Louis, and, after raising the regiment of Noailles in 1689, he commanded in chief in Spain during the war of the Spanish succession, and was made marshal of France in 1693. The younger son, Louis Antoine (1651-1729), took orders, and rose to the most important position of the church in France when he was made archbishop of Paris in 1695. He held his high dignity for more than thirty years, until his death in 1729; he was made a cardinal in 1700. These two distinguished brothers had made their family the most famous in France, with the exception of the Rohans, and the name occurs with almost confusing reiteration throughout the eighteenth century. Adrien Maurice (1678-1766), the third duke, was also a soldier, and learned war under his family in Spain. He served in all the most important wars of the reign of Louis XV. in Italy and Germany, and became the second *maréchal de Noailles* in 1734. His last command in the war of the Austrian succession was not a successful one, for he was beaten by the English at the battle of Dettingen in 1743. Two sons of the third duke also attained the rank of marshal of France. The elder, Louis (1713-1793), who bore the title of duc d'Ayen till his father's death in 1766, when he became duc de Noailles, served

in most of the wars of the eighteenth century without particular distinction, but was nevertheless made a marshal of France, as the *maréchal de Noailles*, in 1775. On the fourth Thermidor, just before the fall of Robespierre, the aged *duchesse de Noailles* was executed with her daughter-in-law, the *duchesse d'Ayen*, and her granddaughter, the *vicomtesse de Noailles*. Jean Paul François (1739–1824), the fifth duke, was, like his family, in the army, but his heart was bent on scientific pursuits, and for his eminence as a chemist he was elected a member of the Academy of Sciences in 1777. He became duc d'Ayen in 1766 on his grandfather's death, and duc de Noailles on his father's in 1793. Having emigrated in 1792, he lived in Switzerland until the restoration in 1814, when he took his seat as a peer of France. He had no son, but several daughters, one of whom married La Fayette, and another her cousin, the *vicomte de Noailles*. He was succeeded as duc de Noailles by his grandnephew, Paul (b. 1802), who has won some reputation as an author, and who became a member of the French Academy in the place of Chateaubriand in 1849. The grandfather of Paul de Noailles, and brother of the fifth duke, Emmanuel Marie Louis (1743–1822), *marquis de Noailles*, was a distinguished diplomatist of the eighteenth century, he was ambassador at Amsterdam from 1770–1776, at London, 1776–1783, and at Vienna, 1783–1792; and, like his brother, he survived the Revolution, and lived to see the Restoration.

One other branch of the family deserves notice. PHILIPPE (1715–1794), *comte de Noailles*, was a younger brother of the fourth duke, and a more distinguished soldier than his brother. He served at Minden and in other campaigns, and was made a marshal on the same day as his brother, under the title of *maréchal de Mouchy*. He was long in great favor at court, and his wife was first lady of honor to Marie Antoinette, and was nicknamed by her *Madame Etiquette*. This court favor brought down punishment in the days of the Revolution, and the old marshal and his wife were guillotined on June 27, 1794. His two sons, the prince de Poix and the *vicomte de Noailles*, were both members of the Constituent Assembly. LOUIS MARIE (1756–1804), *vicomte de Noailles*, was the second son of the *maréchal de Mouchy*, and the most distinguished of his family. He served brilliantly under his brother-in-law La Fayette in America, and was the officer who concluded the capitulation of Yorktown. He was elected to the states-general in 1789, and at once showed his enthusiasm for liberty. He began the famous "orgie," as Mirabeau called it, on August 4, when all privileges were abolished, and with d'Aiguillon proposed the abolition of titles and liveries in June, 1790. When the Revolution became more pronounced he emigrated to America, and became a partner in Bingham's bank at Philadelphia. He accepted a command against the English in San Domingo, under Rochambeau. He made a brilliant defense of the mole St. Nicholas, and escaped with the garrison to Cuba; but in making for Havana his ship was attacked by an English frigate, and after a long engagement he was severely wounded, and died of his wounds on January 9, 1804. The whole family of Noailles had not a more brilliant representative than the friend of La Fayette, Louis, *vicomte de Noailles*.

NOAKHÁLI, or NOACOLLY, a district in the lieutenant-governorship of Bengal, India, with an area of 1,641 square miles, consists of an alluvial tract of mainland, together with several islands at the mouth of the Meghna. The population of the district was 820,772 in 1901, of whom 608,592 were Mohammedans.

NOBILI, LEOPOLDO, born in 1784, became professor

of physics in the archducal museum at Florence. His most valuable contributions to science consist in the suggestion of the astatic combination of two needles, by which the sensibility of a galvanometer is so greatly increased, and in the invention of the so-called thermomultiplier or thermo-electric pile. His own experimental work with these instruments was soon eclipsed by the brilliant applications made of them by Melloni and Forbes. He died in 1834.

NOBILITY. Aristocracy implies the existence of nobility; but nobility does not imply aristocracy; it may exist under any form of government. The peerage, as it exists in the three British kingdoms, is something which is altogether peculiar to them, and which has nothing in the least degree like it elsewhere.

Nobility, in the strict sense of the word, is the hereditary handing on from generation to generation of some acknowledged preëminence, a preëminence founded on hereditary succession, and on nothing else. Such nobility may be immemorial or it may not. There may or there may not be a power vested somewhere of conferring nobility; but it is essential to the true idea of nobility that, when once acquired, it shall go on forever to all the descendants—or, more commonly, only to all the descendants in the male line—of the person first ennobled or first recorded as noble. The preëminence so handed on may be of any kind, from substantial political power to mere social respect and precedence. It does not seem necessary that it should be formally enacted by law if it is universally acknowledged by usage. It may be marked by titles or it may not. It is hardly needful to prove that nobility does not imply wealth, though nobility without wealth runs some risk of being forgotten. This definition seems to take in all the kinds of nobility which have existed in different times and places. They have differed widely in the origin of the noble class and in the amount of privilege implied in membership of it; but they all agree in the transmission of some privilege or other to all the descendants, or to all the male descendants, of the first noble.

In strictness nobility and gentry are the same thing. This fact is overshadowed in England, partly by the habitual use of the word "gentleman" in various secondary uses, partly by the prevalent confusion between nobility and peerage. But that they are the same is proved by the use of the French word *gentilhomme*, a word which has pretty well passed out of modern use, but which, as long as it remained in use, never lost its true meaning. There were very wide distinctions within the French *noblesse*, but they all formed one privileged class as distinguished from the *roturier*. Here, then, is a nobility in the strictest sense. If there is no such class in England, it is simply because the class which answers to it has never been able to keep any universally acknowledged privileges. The word "gentleman" has lost its original meaning in a variety of other uses, while the word "nobleman" has come to be confined to members of the peerage and a few of their immediate descendants.

That the English peerage does not answer to the true idea of a nobility will be seen with a very little thought. There is no handing on of privilege or preëminence to perpetual generations. The peer holds a great position endowed with substantial powers and privileges, and those powers and privileges are handed on by hereditary succession. But they are handed on only to one member of the family at a time. The peer's children, in some cases his grandchildren, have titles and precedence, but they have no substantial privileges. His remoter descendants have no advantage of any kind over other people, except their chance of succeeding to the peerage. The remote descendant of a duke, even

though he may chance to be heir presumptive to the dukedom, is in no way distinguished from any other gentleman; it is even possible that he may not hold the social rank of gentleman. This is not nobility as nobility was understood either in the French kingdom or in the Venetian commonwealth.

The tendency of modern times has been toward the breaking down of formal hereditary privileges. In modern commonwealths, above all, they have been thought to be essentially inconsistent with republican institutions. The truth of the matter is rather that the circumstances of most modern commonwealths have been unfavorable to the preservation, and still more to the growth, of privileged bodies. Where they existed, as in Switzerland, they have been overthrown. Where they did not exist, as in America, everything has made it more and more impossible that they should arise. And, as modern changes have commonly attacked the power both of kings and of nobles, the common notion has come that kingship and nobility have some necessary connection. It has seemed as if any form of nobility was inconsistent with a republican form of government, while nobility in some shape or other, has come to be looked on as a natural, if not a necessary, appendage to a monarchy. And as far as regards the social side of kingship this is true. A court seems more natural where a chain of degrees leads gradually up from the lowest subject to the throne than when all beneath the throne are nearly on a level. And from one point of view, that from which the kingly house is but the noblest of the noble, kingship and nobility are closely allied. But in the more strictly political view monarchy and nobility are strongly opposed. Even the modified form of absolute monarchy which has existed in some Western countries, while it preserves, perhaps even strengthens, the social position of a nobility, destroys its political power. Under the fully developed despotisms of the East a real nobility is impossible; the prince raises and thrusts down as he pleases. It is only in a commonwealth that the nobility can really rule; that is, it is only in a commonwealth that the nobility can really be an aristocracy. And even in a democratic commonwealth the sentiment of nobility may exist, though all legal privilege has been abolished, or has never existed. That is to say, traditional feeling may give the members of certain families a strong preference, to say the least, in election to office. We have seen that this was the case at Athens; it was largely the case in the democratic cantons of Switzerland; indeed the nobility of Rome itself, after the privileges of the patricians were abolished, rested on no other foundation.

NOCERA INFERIORE, formerly **NOCERA DEI PAGANI**, a city of Italy, in the province of Salerno. It had a communal population of 15,858, that of the town is 12,830; but the interest of the place is almost exclusively historical.

NODDY, the name applied, originally by sailors, to a sea-bird from its showing so little fear of man as to be accounted stupid. It is the *Sterna stolidus* of Linnæus, and the *Anous stolidus* of modern ornithology, having the figure of a **TERN** (*q.v.*), and belonging to the subfamily *Sterninae*, but is heavier in flight, with shorter wings and the tail less deeply forked. The plumage is of a uniform sooty hue, excepting the crown of the head, which is light gray. The Noddy is very generally distributed throughout the tropical or nearly tropical oceans, but occasionally wanders into colder climates, and has been met with even in the Irish Sea. It breeds, often in astounding numbers, on low cays and coral-islets, commonly making a shallow nest of seaweed or small twigs, which may be placed on the

ground, on a tuft of grass, or in the fork of a tree, while sometimes it lays its eggs on a bare rock.

NODIER, **CHARLES**, a writer of greater intrinsic merit and more importance in the history of French literature than is generally recognized, was born at Besançon somewhat less than ten years before the outbreak of the Revolution, but the exact date is strangely uncertain. Besançon for the place and April 29th for the day of the month appear to be agreed upon, but the year is sometimes given as 1780, sometimes as 1781, and sometimes as 1783. Having obtained and then lost the post of librarian in his native town, he went to Paris and plunged into literature. He had published a dissertation on the antennæ in insects as early as 1798, at Besançon. Entomology continued to be a favorite study with him, but he varied it with philology and pure literature—*La Peintre de Salzbourg* dates from this early period—and even political writing. A "skit" on Napoleon, in 1803, got him into trouble, which was not very serious. He was obliged, or thought himself obliged, to quit Paris, and for some years lived a very unsettled life at Besançon, Dôle, and other places. In 1811 he appears at Laibach in the singular character of editor of a polyglot journal, the *Illyrian Telegraph*, published in French, German, Italian, and Slav. Then he returned to Paris, and the restoration found him, or made him, an ardent royalist. Literary and journalistic work of all kinds filled up his time until, in 1823, he was appointed to the librarianship of the Bibliothèque de l'Arsenal. He was not disturbed in this post by the revolution of July, but, on the contrary, was elected a member of the Academy in 1833, and made a member of the Legion of Honor in 1843, a year before his death, which happened on January 27, 1844.

NOETUS, a presbyter of the church of Asia Minor about 230 A.D., was a native of Smyrna, where (or perhaps in Ephesus) he became a prominent representative of the particular type of Christology which is now technically called modalistic monarchianism. His views, which led to his excommunication from the Asiatic church, are known to us chiefly through the controversial writings of Hippolytus, his contemporary.

NOIRMOUTIER, an island of France belonging to the department of Vendée, and protecting the bay of Bourgneuf on the southwest. The area amounts to eighteen square miles, of which about a sixth part is occupied by dunes. The total population is 7,726.

NOLA, a city of Italy in the province of Caserta (Terra di Lavoro), is pleasantly situated on the plain between Mount Vesuvius and the Apennines, fourteen miles east-northeast of Naples on the road to Avellino, and twenty and a half miles southwest of Cancello on the railway to the same town. The population of the city was 10,771 in 1871, and 8,489 in 1881; that of the commune 11,395 in 1871, and 12,600 in 1901.

NOLLEKENS, **JOSEPH**, sculptor, was born August 11, 1737, in London, where his father, a native of Antwerp, the "old Nollekens" of Horace Walpole, was a painter of some repute. In his thirteenth year he entered the studio of the sculptor Scheemakers, and practiced drawing and modeling with great assiduity, ultimately gaining various prizes offered by the Society of Arts. In 1760 he went to Rome, and he executed a marble bas-relief, *Timoclea before Alexander*, which obtained a prize of fifty guineas from that society in 1762. Having returned to England in 1770, he was admitted an associate of the Royal Academy in 1771, and elected a member in the following year. The most prominent personal characteristic of Nollekens seems to have been his frugality, which ultimately developed into absolute miserliness. He died in London, April 21, 1823.

NOLLE PROSEQUI (sometimes shortened into *nol. pros.*) is a technical term of law, the meaning of which varies as it is used with reference to civil or criminal cases. In civil cases it applies only to actions, and there signifies a formal undertaking by the plaintiff that he will proceed no further with the action. The more modern practice in such cases is to proceed by way of discontinuance. In proceedings either by indictment or by information, a *nolle prosequi* or stay of proceedings may be entered by the attorney-general.

In America the term bears the same meaning as in England, with one exception. The attorney-general has not the same discretion with which English law invests him. Although in some States the prosecuting officer may enter a *nolle prosequi* at his discretion, in others the leave of the court must be obtained.

NOLLET, JEAN ANTOINE, French physicist, was born at Pimpéz (now in Oise), November 19, 1700, and died at Paris in 1770.

NOMANSLAND. See KAFFRARIA.

NOMINALISM. See SCHOLASTIC PHILOSOPHY.

NONCONFORMITY. The history of the gradual relief of nonconformists in England from their disabilities will be found under ENGLAND, and under the heads of the various denominations, *e.g.*, BAPTISTS, INDEPENDENTS, METHODISM, QUAKERS, etc. See also OATHS.

NONJURORS in English history are the small minority of the benefited clergy who incurred the penalties of suspension and deprivation for refusing to swear allegiance to William and Mary in 1689. The party, which was headed by Archbishop Sancroft and Bishop Ken, with five other members of the episcopal bench, included such men as Jeremy Collier, George Hicke, William Sherlock, Charles Leslie, and Henry Dodwell. (See ENGLAND.)

NONNUS, Greek epic poet, author of the *Dionysiaca*, was a native of Panopolis, in the Egyptian Thebaid. He can scarcely have been earlier than the fifth century of our era, but probably wrote in the first half of it, as his versification is imitated by Proclus, who was born 412 A.D. Nothing is known of his personal history, but his extensive mythological erudition almost proves him to have been a grammarian.

NONPAREIL, the name under which, from its supposed matchless beauty, a little cage-bird, chiefly imported from New Orleans, has long been known to dealers. It is the *Emberiza ciris* of Linnæus, and the *Cyanospiza ciris* of most recent ornithologists, belonging to a small group, which, in the present state of knowledge, cannot with certainty be referred either to the buntings or to the finches, while some authors have regarded it as a *TANAGER*, (*q.v.*) The cock has the head, neck, and lesser wing-coverts bright blue, the upper part of the back yellow, deepening into green, and the lower parts generally, together with the rump, bright scarlet, tinged on the latter with purple. This gorgeous coloring is not assumed until the bird is at least two years old. The hen is green above and yellow beneath; and the younger cocks present an appearance intermediate between the adults of both sexes. The species, which is often also called the Painted Bunting, after wintering in Central America or Mexico, arrives in the southern States of the American Union in April, but does not ordinarily proceed to the northward of South Carolina. In Louisiana, where it is generally known to the French-speaking inhabitants as the *Pape*—as it was to the Spaniards of Florida as the *Mariposa pintada* (painted butterfly)—it is abundant. Belonging to the same genus as the Nonpareil is the indigo bird, *Cyanospiza cyanea*, which, as a summer visitant, is widely diffused from the Missouri to the

Atlantic, and extends into the provinces of Ontario and New Brunswick.

NONSUIT (*i.e.*, *non suit*, he does not pursue) is the name given to a judgment whereby an issue is determined against the plaintiff. It was a term peculiar to the English common-law courts before the Judicature Acts, and was simply the expression of the opinion of the court that, apart from the merits, the plaintiff's case was incomplete. It did not in any way act as a bar to his bringing another action for the same cause.

NOODT, GERHARD, a celebrated jurist, was born at Nimeguen in 1647. He began his studies in his native town, continued them at Leyden and Utrecht, and finished them at Franeker, where he took his doctor's degree in law; after passing through successive grades of promotion he was ultimately appointed to a law chair at Leyden. It was in the character of a writer on jurisprudence, however, that he acquired his reputation. He died in 1725.

NORD, the most northern of the departments of France, formed out of Flanders, French Hainault, and the district of Cambrais (Cambrésis), has a length from southeast to northwest of 112 miles, while its breadth is nowhere more than forty miles, and contracts to four at the point where it is crossed by the Lys. Bounded northwest and north for twenty-one miles by the North Sea, it has the Belgian provinces of West Flanders and Hainault on the northeast and east, the departments of Aisne and Somme on the south, and that of Pas-de-Calais on the west. The climate of Nord is colder than that of France in general, the mean temperature being 49° or 50° Fahr. The rainfall is twelve inches at Dunkirk and a little more at Lille. In the arrondissement of Avesnes, rain is more abundant, and cold more severe. In population (1,877,647 inhabitants) and in agricultural and industrial importance Nord was in 1901 second only to the department of the Seine.

Of the total area (2,193 square miles), two-thirds are arable, one-sixth under pasture, and one-eleventh consists of forest. The grain crops yield about 19,250,000 bushels, potatoes about half as much. Beetroot, flax, tobacco, chicory, colza, rapeseed, and hops are all of importance. The natural pastures support a good breed of Flemish cows. Stone, marble, clay, and sand are obtained in the department; but its mineral wealth lies rather in its coal-pits. Iron-mines also are worked in the arrondissement of Avesnes. The best mineral waters are those of St. Amand. There are numerous foundries, rolling-mills, steelworks, fileworks, agricultural-implement manufactories, and engineering-works. More than 240,000 tons of pig-iron and 279,000 tons of malleable iron, cast-iron, rails, sheet-iron, and Bessemer steel were produced in 1881. Consuming 4,500,000 tons of coal, it has to supplement its own production by importing from Pas de Calais, Belgium, or England. Most of the foreign trade passes through Dunkirk, a much larger port than Gravelines. Abundant means of transit exist throughout the department. The total length of the navigable rivers and canals is 325 miles, and railways to a total length of 450 miles have been constructed between all the most important localities.

Nord forms the archiepiscopal diocese of Cambrai, is comprised in the first or Lille region of *corps d'armée*, and depends on the court of appeal at Douai. It is divided into 7 arrondissements, 61 cantons, and 663 communes. The number of communes of importance especially for their industries is very large.

NORDERNEY (*i.e.*, northern island), the most important of the fringe of sand-islands along the coast of East Friesland, belongs to the Prussian province of Hanover. It is eight miles long and about one mile

broad, and supports a seafaring and fishing population of 2,114, of genuine old Frisian stock.

NORDHAUSEN, a flourishing town in Prussian Saxony, in the district of Erfurt, is situated on the Zorge, at the south base of the Harz mountains, and at the west end of the Goldene Aue (Golden Plain), a fruitful valley watered by the Helme. The chief importance of the place arises from its distilleries, which yearly produce about 8,000,000 gallons of brandy. The breweries are also important, and there are manufactures of leather, tobacco, cotton and linen goods, carpets, chicory, and chemicals. Population (1901), 26,198.

NÖRDLINGEN, a town of West Bavaria, in the district of Schwaben und Neuburg, is situated on the Eger, forty miles to the north of Augsburg. Population, 8,000.

NORFOLK, an eastern maritime county in England, is bounded north and east by the North Sea, south-east and south by Suffolk, southwest by Cambridge, and west by Lincoln. It is of an irregular oval form, its greatest length east and west being sixty-seven miles, and its greatest breadth about forty-two miles. The area is 1,356,173 acres, or 2,119 square miles.

Nearly two-thirds of the boundary of the county is formed by tidal water. There are few bays or inlets, and on the northern coast no river mouths. For the most part the coast-line is flat and low and has been greatly encroached on by the sea, several villages having been engulfed since the time of William the Conqueror. The surface is principally an undulating plain with rising ground skirting the river valleys and low chalk downs in the north and northwest. The principal rivers are the Yare, in the east, with its tributaries, the Bure, the Wensum, and the Waveney; and the Ouse, in the west, with its tributaries, the Little Ouse, the Wissey, and the Nar. Nearly the whole of Norfolk is occupied by chalk, but on account of drift deposits it forms a comparatively small proportion of its surface.

On account of the exposed position of the coast to east and northeast winds, the climate, especially in winter and early spring, is much colder than in the adjacent counties. The air is, however, generally dry, and unhealthy fogs are not common, except in the marshy districts. Norfolk contains a greater variety of soil than any other county in England. According to the agricultural returns of 1883, the area of cultivation was 1,087,270 acres—a percentage of about eighty of the total area.

At an early period Norfolk was one of the principal seats of the cloth trade in England, worsted deriving its name from having been first manufactured at Worstead. The weaving of silk and wool is still carried on at Norwich, and also shawl weaving, although the staple trade of the town is now boots and shoes. Silk is also manufactured at Yarmouth, Wymondham, and North Walsham. The population in 1901 was 313,438, of whom 165,266 were males and 148,172 (females).

NORFOLK, a city and port of entry of the United States, in Norfolk county, Va., opposite Portsmouth, on the north bank of the Elizabeth river, an arm of Chesapeake Bay. It is the terminus of the Norfolk and Western Railroad (408 miles) and the Norfolk Southern Railroad (74 miles), has easy access to the Dismal Swamp Canal (from Elizabeth City to the Pasquotank river), and the Albemarle and Chesapeake Canal, navigable for vessels of 500 tons, and is connected by regular lines of steamers with Richmond, Baltimore, Philadelphia, Boston, Providence, Washington, and New York. The city lies low, and is somewhat irregular in its arrangement, but the streets are generally wide. The city hall, with a cupola 110 feet high, the custom-house and postoffice, the Norfolk academy, the masonic

temple, the mechanics' hall, and some of the banks are the most conspicuous of the secular buildings.

Norfolk is the seat of the United States navy-yard, one of the largest in the country. It is one of the most important cotton markets of the United States, and its annual receipts were 500,308 bales; total direct exports, 235,622 bales; domestic shipments, 263,360 bales; value of direct exports, \$10,938,162. The total value of all exports was \$12,381,122. Norfolk has a bonded debt of \$2,520,898; the annual receipts of the city treasury (1889) were \$546,706; expenditures, \$505,409. The total assessed valuation was \$15,210,805; rate of taxation, \$1.77 on the \$100. There is a police force of forty-six men, costing \$36,000, and a fire department maintained at a cost of \$19,000. The population of school age numbers 7,430; school enrollment, 2,860; cost of schools, \$22,541. There are seven school buildings, and the school property is valued at \$73,850. Population (1901), 38,871.

Founded in 1705, Norfolk was incorporated as a borough in 1736, and as a city in 1845. In 1776 it was burned by the British. At the opening of the Civil War it was the chief naval depot of the Confederates, but at an early date in the contest the vessels and yard were destroyed, and in May, 1862, the town was occupied by the Federal forces.

NORFOLK ISLAND, with the much smaller Nepean Island and Phillip Island, lies about 400 miles north-northwest of New Zealand, on a submarine tableland extending eighteen miles to the north, and twenty-five miles to the south, with an average breadth of eighteen miles. Measuring about six miles in length from northwest to southeast, Norfolk Island has an area of 8,607 acres, or eleven and one-half square miles. The breakers of the Pacific beating on its high cliff-bound coast render it difficult or even impossible to land except at two places, and even there not without danger. The climate is genial and healthy, the thermometer rarely sinking below 65°. In 1862 the population was 268; in 1871, 481; and in 1900, 870. The descendants of the Pitcairn Islanders, who form two-thirds of the inhabitants, have their chief settlement on the south side, on Sydney Bay, where the buildings of the old penal establishment were placed at their disposal. A thousand acres on the west side of the island are held by the mission station of St. Barnabas, founded by Bishop Patteson, where 150 Melanesian boys and girls receive education.

NORICUM was the ancient name of the country south of the Danube, around the rivers Inn and Drave, and extending on the south to the banks of the Save. The original population appears to have been Illyrian, but in the great emigration of the Gauls the country was occupied by a Celtic people, Taurisci or Norici.

NORMANBY, **CONSTANTINE HENRY PHIPPS**, **MARQUIS OF**, bore an eminent, though not a leading, part in some of the greatest movements of this century. As governor of Jamaica he had charge of the distribution of the huge compensation to owners upon the abolition of slavery in the West Indies; it fell to him as lord-lieutenant of Ireland to give effect to the Catholic Emancipation Act; he was English ambassador at Paris during the revolution of 1848, and minister in Tuscany in the years immediately preceding the struggle for Italian unity. The son of the first earl Mulgrave, and born May 15, 1797, he passed through Harrow and Trinity College, Cambridge, and sat for the family borough of Scarborough as soon as he attained his majority. Lord Normanby reached the zenith of his career between the age of thirty and forty; after that he began to lag and to decline in political reputation. He succeeded his father as Earl Mulgrave in 1831, was sent

out as captain-general and governor of Jamaica in the same year, and, in spite of certain defects of manner, gained such credit as an administrator that he was appointed lord-lieutenant of Ireland in 1835. He was created marquis of Normanby in 1838, and held successively the offices of colonial secretary and home secretary in the last years of Lord Melbourne's ministry. From 1846 to 1852 he was ambassador at Paris, and from 1854 to 1858 minister at Florence. He died in London, July 28, 1863.

NORMANDY is the name which was given to part of northern Gaul in consequence of its occupation in the early part of the tenth century by the Northmen, whose name was on Gaulish soil gradually changed into Normans. Till that time the land which has ever since borne the name of Normandy had no distinct name, nor any separate political being. In ecclesiastical geography it answers very nearly, but not quite exactly, to the province of Rouen. Politically it was, at the time of the Scandinavian settlement, part of the great duchy of France, of which it took in nearly the whole of the seacoast.

Normandy, in its widest extent, reached on the eastern side to the rivers Eu and Epte, of which the Eu empties itself into the English Channel near the town of that name, while the Epte flows in the opposite direction and joins the Seine near Vernon.

But the main feature of the country is its seacoast and great river. A glance at the map will show that the coast of Normandy, long as it seems, is little more than the mouth of the Seine. To the west that mouth is guarded by the peninsula of Coutances, the Danish land which, it has been remarked, is the only peninsula in Europe, besides the older Danish land, which points to the north. To the west this peninsula presents a bold front to the Atlantic, forming with the Breton coast a bay in which lie the Norman islands, Jersey, Guernsey, Alderney, Sark, and some smaller ones. Normandy, in fact, was the seaboard of France in the strict sense, the coast lying between Brittany on the one side and Flanders on the other. It is that part of the Continent which lies most directly opposite Britain. The Norman duchy, in short, as long as it had an independent being, was interposed between England and France; and in that position lies the key to its whole history.

The chief city of the duchy was always the ecclesiastical metropolis of Rouen (*Rothomagus*), the great city of the lower Seine.

In the divisions of modern France, Normandy answers to the departments of Lower Seine (cap. Rouen), Eure (cap. Evreux), Orne (cap. Alençon), Calvados (cap. Caen), Manche (cap. St. Lo), and to the modern dioceses of Rouen, Evreux, Séez, Bayeux, and Coutances. The boundaries of Rouen and Evreux have been changed; Lisieux has been joined to Bayeux, and Avranches to Coutances. The archbishop of Rouen still keeps the title of primate of Normandy; otherwise the name of the duchy has gone out of formal use.

NORMANS is the softened form of the word "Northman," applied first to the people of Scandinavia in general, and afterward specially to the people of Norway. In the form of "Norman" (*Northmannus*, *Normannus*, *Normand*) it is the name of those colonists from Scandinavia who settled themselves in Gaul, who founded the Norman duchy, who adopted the French tongue and French manners, and who from their new home set forth on new errands of conquest, chiefly in the British Islands and in southern Italy and Sicily. From one point of view the expeditions of the Normans may be looked on as continuations of the expeditions of the Northmen. As the name is etymologically the same, so the people are by descent the

same, and they are still led by the old spirit of war and adventure.

NORMANTOWN, a township in the West Riding of Yorkshire, England, is situated on the Calder river, and on several railway lines. Population, 8,000.

NORRIS, JOHN, was born in 1657 at Collingbourne-Kingston, in Wiltshire, where his father was then incumbent. He was educated at Winchester School, and entered at Exeter College, Oxford, in 1676. In 1680 he took his degree and was elected to a fellowship at All Souls' College. He first made himself known in the university, Anthony Wood tells us, by a translation of Robert Waring's philosophical poem, *Effigies Amoris*, entitled *The Picture of Love Unveiled*. This appeared in 1682, and was followed in 1683 by his first original work, *An Idea of Happiness*.

In 1691 Norris was transferred to Bemerton, a pleasant rural charge near Salisbury, where George Herbert had been parish priest in the earlier part of the century. A few miles distant is Langford Magna, where from 1704 onward Norris had a congenial metaphysical neighbor in the person of Arthur Collier, the future author of *Clavis Universalis*. The remaining twenty years of Norris' life were spent at Bemerton, the flight of time marked only by the works that still came in rapid succession from his pen. He died in 1711.

NORRISTOWN, capital of Montgomery county, Penn., lies on the north bank of the Schuylkill river, opposite Bridgeport (with which it is connected by two bridges), and sixteen miles northwest of Philadelphia by the Germantown and Norristown branch of the Philadelphia and Reading Railroad. It is a well-built and pleasant town, and contains blast-furnaces and rolling-mills, wool and cotton mills, glassworks, an oil refinery, and various other manufacturing establishments, considerably indebted for their success to the water-power of the Schuylkill river. The hospital for the insane of the southeastern district of Pennsylvania is situated here. The most conspicuous buildings are the marble county courthouse (1855), the music-hall, and the jail. The population was 6,024 in 1850, 8,848 in 1860, 10,753 in 1870, 13,063 in 1880, and 22,265 in 1900. The town occupies the site of the old Swedes' Ford, and owes its name to Isaac Norris, who purchased the ground from William Penn. It was incorporated as a borough in 1812, and enlarged in 1853.

NORRKÖPING, the "Manchester of Scandinavia," a town of Sweden in the province of Östergötland, 113 miles southwest of Stockholm by rail. Having been burned by the Russians in 1719 and visited by further conflagration in 1812, 1822, and 1826, the whole town, since rebuilt, has quite a modern appearance, with wide and regular streets. Steamers, gunboats, and iron-clads, as well as smaller craft, are constructed in the shipyard on the lower Motala. At the close of the seventeenth century Norrköping was a place of from 5,000 to 6,000 inhabitants; after the Russian invasion it sank to 2,600, but afterward gradually rose, until in 1861 the total amounted to 20,828, and in 1900 to 41,008.

NORTH, LORE. Frederick North, second earl of Guilford, but better known by his courtesy title of Lord North, was prime minister of England during the important years of the American War. The only son, by his first marriage, of Francis, seventh Lord North (grandson of Lord Keeper North), who was created earl of Guilford in 1752, Frederick was born on April 13, 1732, and, after being educated at Eton and Christ Church, Oxford, was sent to make a grand tour of the Continent. On his return he was, though only twenty-two years of age, at once elected M.P. for Banbury, of which town his father was high steward; and he sat for the same town in parliament for nearly

forty years. In 1759 he was chosen by the duke of Newcastle to be a lord of the treasury, and continued in the same office under Lord Bute and George Grenville till 1765. He had shown himself such a ready debater that on the fall of the first Rockingham ministry in 1766 he was sworn of the privy council, and made paymaster-general by the duke of Grafton. His reputation for ability grew so high that in December, 1767, on the death of the brilliant Charles Townshend, he was made chancellor of the exchequer. His popularity with both the House of Commons and the people continued to increase, for his good temper was never ruffled, and his quiet humor was perpetually displayed; and, when the retirement of the duke of Grafton was necessitated by the hatred he inspired and the attacks of Junius, no better successor could be found for the premiership than the chancellor of the exchequer. Lord North succeeded the duke in March, 1770, and continued in office for twelve of the most eventful years in English history. George III. had at last overthrown the ascendancy of the great Whig families, under which he had so long groaned, and determined to govern as well as rule. He knew that he could only govern by obtaining a majority in parliament to carry out his wishes, and this he had at last obtained by a great expenditure of money in buying seats, and by a careful exercise of his patronage. But in addition to a majority he must have a minister who would consent to act as his lieutenant, and such a minister he found in Lord North. How a man of undoubted ability such as Lord North was could allow himself to be thus used as a mere instrument cannot be explained; but the confidential tone of the king's letters seems to show that there was an unusual intimacy between them, which may account for North's compliance. The path of the minister in parliament was a hard one; he had to defend measures which he had not designed, and of which he had not approved, and this, too, in a House of Commons in which all the oratorical ability of Burke and Fox was against him, and when he had only the purchased help of Thurlow and Wedderburne to aid him. The most important events of his ministry were those of the American War of Independence. One of his first acts was the retention of the tea-duty, and he it was also who introduced the Boston Port Bill in 1774. When the war had broken out he earnestly counseled peace, and it was only the earnest solicitations of the king not to leave his sovereign again at the mercy of the Whigs that induced him to defend a war which from 1779 he knew to be both hopeless and impolitic. At last, in March, 1782, he insisted on resigning after the news of Cornwallis' surrender at Yorktown. He had been well rewarded for his assistance to the king; his children had good sinecures; his half-brother, Brownlow North, was bishop of Winchester; he himself was chancellor of the university of Oxford, lord-lieutenant of the county of Somerset, and had finally been made a knight of the Garter, an honor which has only been conferred on three other members of the House of Commons, Sir R. Walpole, Lord Castlereagh, and Lord Palmerston. Lord North did not remain long out of office, but in April, 1783, formed his famous coalition with his old antagonist, Fox, and became secretary of state with him under the nominal premiership of the duke of Portland. He was probably urged to this coalition with his old opponent by a desire to show that he could act independently of the king, and was not a mere royal mouthpiece. The coalition ministry went out of office on Fox's Indian Bill in December, 1783, and Lord North, who was losing his sight, then finally gave up political ambition. He played, when quite blind, a somewhat important part in the debates on the Regency Bill in 1789, and in

the next year succeeded his father as earl of Guilford. He did not long survive his elevation, and died peacefully on August 5, 1792.

NORTH, SIR DUDLEY, political economist, was third son of Dudley, fourth Lord North, who published, besides other things, *Passages relating to the Long Parliament*, of which he had himself been a member. He was born May 16, 1641. During the Tory reaction under Charles II. he was a pliant instrument in the hands of the court, and was one of the sheriffs forced on the city of London with an express view to securing verdicts for the crown in the state trials of the period. Having been elected a member of parliament under James II., "he took," says Roger North, "the place of manager for the crown in all matters of revenue." After the Revolution he was called to account for his alleged unconstitutional proceedings in his office of sheriff, and did not show much highmindedness in his defense. He died December 31, 1691.

NORTH, ROGER, in writing his *Examen* of Kennet's *History of England*, and the "Lives" of his brothers, Lord Keeper Guilford, Sir Dudley North, and John, master of Trinity College, Cambridge, became one of the original authorities for the political and social history of the reigns of Charles II. and James II. He was born in 1650 and died in 1733.

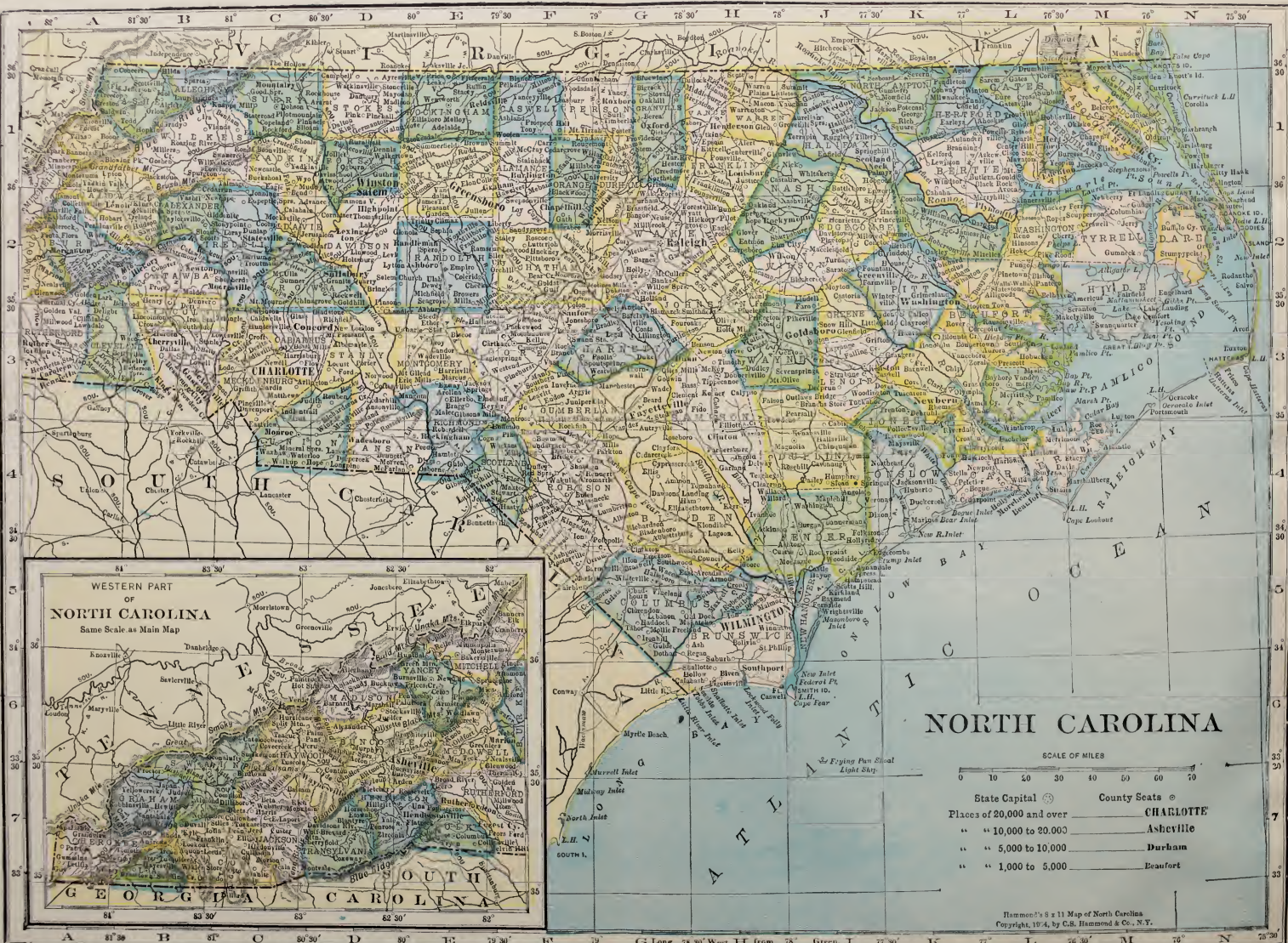
NORTH, SIR THOMAS, son of Edward North, first Baron North of Kirtling, is memorable as the author of the English version of Plutarch's *Lives* that supplied Shakespeare with materials for his classical plays. Materials for a biographical notice are extremely scanty; and neither the exact date of his birth nor that of his death is known. His literary career was long, for he was living in decayed old age in 1603 when a third edition of his Plutarch was published with a supplement of other translated biographies.

NORTH ADAMS, a township, manufacturing village, and important railway junction in Berkshire county, Mass., on the Hoosac river, 143 miles from Boston by the Troy and Boston Railroad. Cotton and wool weaving and shoemaking are the leading industries. The population of the township, formerly included in Adams township, is 24,200. About a mile to the east of the village the Hudson's Brook is arched over for a considerable distance by a romantic cave from thirty to sixty feet in height. Nathaniel Hawthorne, who spent the summer of 1838 at North Adams, gives a fine description of the spot.

NORTHALLERTON, a market-town and parliamentary borough in the North Riding of Yorkshire, is situated on a small stream, the Sun Beck, a tributary of the Wiske, and on the Northeastern Railway, about forty miles north of Leeds and seventeen north of Ripon. Population about 5,000.

NORTHAMPTON, an inland county of England, is bounded north by Lincoln, northwest by Rutland and Leicester, west by Warwick, southwest and south by Oxford, southeast by Buckingham, and east by Bedford, Huntingdon, and Cambridge. It has an area of 629,912 acres, or about 982 square miles. Its greatest length from northeast to southwest is about seventy miles; in breadth it varies from seven to twenty-six miles. The county forms the principal watershed of central England, nearly all the more important rivers of this region having their sources within its boundaries.

The iron of Northamptonshire was made use of by the Romans, but the rise of the modern industry dates from about 1850. In 1881 iron was worked at thirty different places in the county, the total quantity obtained being 1,270,544 tons. About one-fourth is smelted in the district, but the greater quantity is sent raw to Merthyr-Tydfil and Staffordshire.



The climate of Northamptonshire is mild and genial, while the absence of lofty hills renders it much drier than many other inland districts. The prevailing soil is a rich brown but light and crumbling mold, sometimes with a rocky subsoil. The richest soil is the black mold of the fen district, which is specially suited for grass, as are all the heavier soils. Nearly all the land is capable of cultivation, although there is some stiff wet soil on the slopes of the hills. The population of Northamptonshire in 1801 was 131,757, which in 1821 had increased to 162,483, in 1871 to 243,891, and in 1901 to 248,586 (124,000 males and 124,586 females).

NORTHAMPTON, a municipal and parliamentary borough, and the county town of Northamptonshire, is situated on the slope and summit of an eminence rising above the river Nene, on a branch canal connecting it with the Grand Junction Canal, sixty-five miles north-northwest from London. The older houses are substantially built of stone, the newer ones of brick with stone facings. Formerly there were seven parish churches, but of these only four now remain, All Saints, St. Giles', St. Peter's, and St. Sepulchre's. Among the educational establishments are a free grammar school (1552), a government school of art (1871), and a bluecoat school, in addition to charity, church, and school-board schools. The charitable foundations comprise St. John's Hospital, founded in the twelfth century; St. Thomas Hospital, founded 1450, in honor of Thomas à Becket; the general infirmary (1747), the general lunatic asylum (1837), the union workhouse (1837), and the Royal Victoria Dispensary (1844). Among the public buildings are the town hall in the Gothic style (1864), the county hall in the Grecian, the corn exchange buildings in the Italian, the county jail, the borough jail, the barracks, and the theater. There is a fine public promenade, and a racecourse with an area of 117 acres. A new cattle market was opened in 1873. Northampton is unrivaled in England for the manufacture of boots and shoes. There are also currying-works, breweries, maltings, iron-foundries, flour and paper mills, and brick and tile works. The population in 1901 was 87,021.

NORTHAMPTON, the county seat of Hampshire county, Mass., is situated on the west side of the Connecticut river, seventeen miles by rail north of Springfield, and is connected with Hadley by a bridge 1,230 feet long. The village of Northampton lies in rich alluvial meadow-land, about a mile from the bank of the river, and with its semi-rural streets and venerable trees has the reputation of being one of the prettiest villages in New England. Of note among its buildings are Smith College (1871; endowment, \$500,000) for the higher education of women, the free public library (18,000 volumes) and memorial hall, the Clarke institution for deafmutes (1867; endowment, \$300,000) on rising ground to the west, and the State lunatic asylum (1858; 460 patients). A tramway runs three miles to Florence, a manufacturing village producing sewing-machines, silk goods, paper, etc. The population of the township was 5,278 in 1850, 6,788 in 1860, 10,160 in 1870, and in 1900 was 18,643.

NORTHAMPTON, HENRY HOWARD, EARL OF, the second son of the earl of Surrey, the poet, born about 1539, was restored in blood by the first parliament of Elizabeth. He bore a high character for learning, but during the greater part of Elizabeth's reign he remained in obscurity, sharing the fortunes of his family. In 1604 he was made lord warden of the Cinque Ports and earl of Northampton. In 1608 he became lord privy seal, and in 1612 one of the commissioners of the treasury. Northampton died in 1614.

NORTHAMPTON, SPENCER COMPTON, EARL OF,

born in 1601, accompanied Prince Charles to Spain in 1623. He succeeded to the earldom in 1630. In the Civil War he took the king's side, opposing Lord Brook in Warwickshire in 1642, and taking part in the battle of Edgehill. On March 19, 1643, he was dismounted in the fight at Hopton Heath near Stafford, and was immediately slain.

NORTH ATTLEBORO, a town of Bristol county, Mass., thirty-two miles southwest of Boston. It contains a bank, a high school, four churches, a newspaper office and some manufactures. Population (1890), 7,000.

NORTH BRIERLEY, an urban sanitary district in the West Riding of Yorkshire, England, about two miles south of Bradford. There are extensive collieries in the district as well as blast and puddling furnaces and rolling-mills, the ironworks at Low Moor employing between 3,000 and 4,000 persons. The population of the urban sanitary district (area 4,309 acres) in 1871 was 18,616, and in 1901 it was 24,935; that of the township of North Brierley (area 3,342 acres) in the same years was 14,433 and 15,620.

NORTH CAROLINA, one of the original thirteen States that formed the American Union, is situated on the Atlantic seaboard, and stretches 500 miles east and west across the entire breadth of the Atlantic slope of the Appalachians in a long, narrow, rudely triangular belt, its western extremity, less than twenty miles wide, resting on the highest plateau and summits of that continental system of mountains, while its eastern end spreads out to a breadth of 200 miles in a low, level, and gently undulating plain on the Atlantic coast, with a curving shore-line of more than 300 miles. Its area is 52,674 square miles, of which 4,094 are covered by water.

The western section is a rugged mountainous plateau; it forms a narrow, irregular, much indented trough, lying between the bifurcating chains of the western and dominant arm of the southern prolongation of the Appalachians—the Smoky Mountains and the Blue Ridge—the former being the western boundary of the State. The length of this plateau from northeast to southwest is more than 200 miles, its breadth 15 to 50 miles, and its area nearly 6,000 square miles. The Smoky chain has a general elevation of from 5,000 to 6,000 feet, rising in many summits to 6,500 feet and upward. The Blue Ridge, which constitutes the eastern boundary of the plateau, is a very sinuous and angular and straggling mountain chain, with a general elevation of from 3,000 to 4,000 feet and upward, a few of its higher summits, about midway in the State, reaching nearly 6,000 feet.

This middle region of the State is a country of hills and valleys and rolling uplands. The area of this region is about 20,000 square miles; its altitude, descending gradually from 1,000 to about 200 feet, averages about 650 feet. Eastward, to the sea, lies a great champaign, 100 to 120 miles wide, and 20,000 square miles in area. Toward the coast it is diversified by numerous and extensive sounds, bays, rivers, lakes, marshes, swamps, and islands, the whole surface for fifty miles inland from Hatteras and the eastern shore being less than twenty feet above sea-level. The sea is walled off from this low-lying territory by a long linear chain of sand-islands or dunes, ranging from 75 to 100 feet and upward in height, and separated in half a score places by inlets which connect the sounds with the ocean.

The features above described give the main outlines of the drainage system, the Blue Ridge being obviously the chief factor. The streams which rise east of that chain empty into the Atlantic, either directly through the territory of this State or by crossing also that of South Carolina; those which rise west of it seek the

Mississippi and the Gulf of Mexico, partly by way of the Tennessee, many of whose chief affluents have cut their way in a northwesterly course across the mountain plateau and through the Smoky range, and partly by way of the Ohio, leaving the plateau in a northeasterly direction and reaching that river by the Kanawha through Virginia. Several of the most considerable rivers take their rise in the midland region. The numerous rivers of the eastern section, as they approach the sounds and the sea, broaden into bays of two, three, and five miles in width, through which the movement of the tide is felt to a distance of fifty and sixty miles inland, and many of them are navigable for more than 100 miles to the lower falls near the western border of the alluvial region.

In climate North Carolina resembles France and Italy. The position of the eastern end on the Atlantic and its projection southward beyond the parallel of 34° , together with the near approach of the Gulf Stream, give this part of the State a sub-tropical climate, its isotherm (66°) being that of the southern half of the Gulf States and of Nicolosi in Sicily, while the great elevation and inland recession of the western section bring its climate to that of the cold temperate zone, the isotherm for the higher plateaus (51°) being that of New England and Upper Canada. The average annual mean temperature of the State is 59° ; for the eastern region it is 61° , for the middle 58° , and for the mountainous region 52° . During a recent winter of unusual severity the thermometer several times indicated 30° and 40° below zero in Michigan and New England, while in North Carolina 10° above zero was reached but once. The mean annual rainfall is nearly double that of England and France, the average for the State being fifty-two inches, and for the east, middle, and west, respectively, sixty, forty-five, fifty-eight inches. This precipitation is distributed nearly uniformly through the different seasons, with a slight preponderance in the amount of summer rain and a correspondingly less quantity in the autumn. The climate is favorable to human health, except in limited malarial tracts in the lowlands on some of the rivers. The death-rate for this State is less than the average for the United States, and one of the two areas where consumption is unknown is found here.

In consequence of the wide distribution of the older rocks there is a notable abundance and variety of minerals. More than 180 species have been discovered, some of great rarity; and one of them has recently yielded to science two new metallic chemical elements. Nearly a score different species of gems have been found, including the diamond, ruby, sapphire, emerald, beryl, lazulite, amethyst, garnet agate, and zircon. There occur also many minerals having special applications in the useful arts, viz., mica, corundum, asbestos, baryte, chromic, iron, garnet, zircon, kaolin, black oxide of manganese, talc, pyrophyllite, etc. Mica is found in large veins or dykes in all the terranes of Montalban gneisses, but the most extensive and valuable mines are found in the mountain region, where workable veins are numerous and extensive and the sheets of mica of unusual size and excellence. Corundum is about as widely distributed as mica, and occurs in the same series of rocks, as well as in some of the slate belts. In this region are also numerous beds of white and variously-colored marbles. Building stones of every variety are found in nearly all the sections, and whetstone, millstone, and grindstone grits, as well as potter's clay and fireclay; and in the seaboard section are immense beds of peat. Iron, copper, and gold ores are coextensive with the outcrops of the metamorphic rocks. Blackband ore is associated with the coal, and spathic ore occurs as the gangue of several copper and gold mines in the

middle region. Iron for domestic consumption has been manufactured for a hundred years in the middle region and half as long in the other sections. Gold occurs in both placers and veins from Halifax county on the upper margin of the eastern champaign, within 110 miles of the seacoast. These deposits cover several hundred square miles of territory, and are of Quaternary or more recent age. Compared with those of California, they are of very slight thickness, generally not above five or ten to twenty feet, and only occasionally reaching forty and fifty feet. The most important and valuable vein mines are also found in the midland region. One of these, the Gold Hill mine near Salisbury, has been wrought to a depth of 750 feet, and its total produce exceeds two million dollars of bullion.

The whole area of the State was originally forest-covered, and about two-thirds of it is still in the primitive condition, except that the woods are much denser in consequence of the cessation of the annual burnings by which the Indians kept down the brush and preserved them in an open park-like condition. The great variety of soils, together with the wide range of climate, gives rise to a remarkably rich and varied flora. Of twenty-two species of oak found in the United States east of the Rocky Mountains, nineteen occur here; of eight pines, all are found in one section or another; of five maples, all; of nine hickories, six; of seven magnolias, all; of five birches, three; and so on. The total number of trees found in the State is 112, and there are just twice as many shrubs, many of them twenty feet and upward in height, which together give these forests an aspect of wonderful richness and variety, "comparing favorably with almost any portion of the tropics." Among the trees are many valuable and popular cabinet woods, such as the walnut, holly, cherry, ash, cedar, bird's-eye-maple, sycamore, etc. These forests are rapidly increasing in value as those of the northern States disappear and as the demand for timber increases.

In 1790, at the first United States census, the population was 390,000. In 1860, the year before the Civil War, it had risen to 992,622, of whom 391,522 were colored. In 1870, it was 1,071,361, an increase during this decade of less than 8 per cent. In 1880 it was 1,339,750 (531,277 colored, and 1,230 Indians), and the census of 1900 gave it at 1,893,810. The foreign-born population numbered but 4,492. The people of this State are among the most rural in the United States. The largest city does not contain 30,000 people, and only eight exceed 7,000, viz.: Wilmington, 20,976; Raleigh, 13,643; Charlotte, 18,091; New Berne, 9,090; Asheville, 14,694; Greensboro, 10,035; and Winston, 10,008.

Cotton and rice are staple products of the east, live stock, buckwheat, and other north-temperate zone products, of the mountain region; in one section or another may be found every agricultural product grown between the great lakes and the Gulf, except the orange. Indian corn occupies the largest acreage, and this and the other cereals are common to all sections. Cotton is raised in two-thirds of the counties. It is the chief market crop of the eastern and of the southern half of the middle region. The limit of cotton culture has extended northward twenty to fifty miles in the last fifteen years, and the produce has increased nearly threefold. In the northern half of the middle and Piedmont districts tobacco replaces cotton as the market crop. Within ten years its culture has extended into a large portion of the mountain region. The northern tier of counties, next to the Virginia border, is known as the Bright Tobacco Belt—the larger part of the yellow or gold-leaf tobacco of commerce being produced in this narrow zone. This crop has also largely increased in the last ten years. The cultivation of the vine is also in-

creasing in all sections of the State. According to Humboldt's thermal criteria the whole State lies within the zone most favorable to this industry. His conclusions are confirmed by experience in every part of the State, and by the fact that several of the most popular grapes have originated here, such as the Catawba, Isabella, and Scuppernong.

The following table gives the principal crops in 1899:

CROPS.	BUSHEL.	ACRES.	VALUE.
Corn	34,818,860	2,720,206	\$17,304,407
Wheat.....	4,342,351	746,984	3,463,726
Oats	2,454,768	270,876	991,516
Barley.....	4,237	475	2,335
Rye	133,730	28,074	86,228
Buckwheat.....	52,572	5,168	25,482
Potatoes.....	1,636,445	23,619	862,509
Sweet potatoes.....	5,781,587	68,730	2,119,956
Rice (pounds).....	7,838,586	22,279	203,075
Tobacco (pounds).....	127,503,400	203,023	8,098,691
Cotton (bales).....	459,707	1,007,020	15,696,952
Hay and forage (tons)	429,824	229,998	4,242,561

Mining and other industries, although of very subordinate interest, have long given occupation to a small portion of the population. Gold was first discovered in 1819, and between that date and 1850 hundreds of gold and copper mines were opened in the middle and western sections, and many thousands of the population were occupied in these industries. The total product of the gold mines between those dates is estimated at about \$10,000,000. In the last few years mining industries have received a new impulse. Iron ores are mined on a considerable scale for export, many new gold and copper mines have been opened, and the amount of the output of the various mining industries is increasing very notably. Mica mining began fifteen years ago in the mountain region, and has grown to considerable importance, much the larger part of this material found in commerce being produced here. The annual yield is about 40,000 pounds, and is continually increasing.

The fisheries of the eastern rivers and sounds are large and profitable, and give employment to several thousand people. And in this region the getting of lumber, both in the pine forests and in the cypress and juniper swamps, has been an important source of profit since its first settlement.

The manufactures of North Carolina occupy a very subordinate place and are mainly domestic and auxiliary to the one dominant agricultural interest. The value of the total annual output, as given by the census of 1900, is \$94,919,663. Of this sum \$28,372,798 is derived from the manufacture of cotton goods, \$13,620,816 from that of tobacco, and \$14,862,593 from timber products.

In ten years the number of miles of railroad has been nearly doubled, and is now 3,697 miles. There are 1,000 miles of waterways open to steamboat navigation, including rivers, bays, sounds, and canals, forming a nexus of lines of communication extending over the whole eastern and seaboard region and connecting with the various ports along the coast from Wilmington to Norfolk in Virginia.

The executive power is vested in a governor, lieutenant-governor, secretary of state, auditor, treasurer, superintendent of public instruction, and attorney-general, who are elected by ballot, and hold office four years. The legislative power is vested in a general assembly, which consists of a senate of fifty members and a house of representatives of 120 members, who are elected for two years and hold biennial sessions. The judicial power is vested in a supreme court, superior courts, and courts of justices of the peace. The supreme

court consists of a chief justice and two associate justices. The State is divided into nine judicial districts, and there is one superior court judge to each. The judges of the supreme and superior courts are elected by popular vote for a term of eight years. The justices of the peace, who administer the law in the counties, are appointed by the legislature. A capitation tax, which may not exceed \$2, is levied for the support of a system of education. Other State taxes are levied *ad valorem*, and amount at present to 32 cents on each \$100 worth of property, and this on a very low valuation. The public debt is \$6,527,770. The total assessed valuation of property is \$287,340,000; the real value is about \$350,000,000. A system of public schools is established by law and supported by funds derived from State taxes, and increased by county and municipal levies. The schools are required to be kept open four months in the year.

The coast of North Carolina was the scene of the first effort of the English to colonize America. In the years 1585 to 1587 Sir Walter Raleigh dispatched hither five fleets in succession, and planted three small colonies, which disappeared one after the other and left no trace. In consequence of these failures, due in large measure to the peculiar conformation of this difficult coast and the want of good harborage, the next expedition, twenty years later, was directed to strike the coast farther north, about the mouth of the James river, where the first permanent settlement was effected; and no further attempt at direct colonization from Europe was made for three-quarters of a century. Thus, instead of being the first of the American colonies in point of time, the colony of Carolina came very near being the last. The southern boundary of the colony of Virginia was the parallel of 36° 30' N. latitude, although the whole continent was still called by that name, and all the country south of this limit to the Gulf was granted by Charles II. in 1663 and 1665 to a company of English noblemen styled the lords proprietors, with full powers of colonization and government. In this territory, called Carolina in compliment to the royal grantor, the colony of Carolina was planted by them under a new form of colonial government called the proprietary government, consisting of a governor appointed by themselves, a legislative assembly elected by the freeholders, and a council of twelve, six appointed by the governor and six by the assembly. In 1669 the first legislative assembly met, and a new and remarkably liberal government was successfully organized. The next year an attempt was made to introduce a new system of government and form of social order called the Fundamental Constitutions, drawn up by the celebrated philosopher John Locke at the request of the lords proprietors; but this and several subsequent attempts were so stoutly resisted by the colonists that the absurd and tyrannous scheme was formally abandoned in 1693. In 1729 the proprietary was replaced by the royal authority, the form of government remaining unchanged. At this date also the territory of Carolina was formally divided into the two colonies of North and South Carolina. The population at this time, estimated at 13,000, was mostly limited to the seaboard region, within fifty miles of the coast.

The execution of the infamous Stamp Act in 1766 was forcibly resisted, and the royal vessel bringing the obnoxious papers was not even allowed to enter port. Extortion practiced by the officers of the crown in some of the interior counties led to repeated remonstrances and appeals for redress to the governor and afterward to parliament, and finally ended in 1771 in insurrection and open war. The controversy culminated in the battle of Alamance, in which the recusants were defeated by Governor Tryon. And thus, in one way and an

other, a spirit of suspicion or resentment, of irritation or open hostility, was constantly kept alive in the colony. This spirit found expression in the famous Mecklenburg resolutions adopted by the Scotch-Irish settlers about Charlotte in May, 1775, in which "all laws and commissions by authority of king and parliament" are declared to be annulled and vacated, and a new government was organized for the county recognizing only the authority of the Provincial Congress. Thus North Carolina was fully ripe for measures of open and combined resistance when movements were begun toward a union of the colonies for this purpose, and was the first of all the colonies to instruct its delegates to the Continental Congress to vote for formal independence of the British crown. Early in 1776 the militia of the colony met and defeated on the lower Cape Fear river a body of 1,500 British troops under skillful officers, directed by the royal governor, and supported by a British fleet of thirty sail off the port of Wilmington. The colony furnished its full quota of troops to the continental armies north and south, and lost most heavily in the fall of Charleston. The defeat and capture of an important detachment of Cornwallis' army under Ferguson at King's Mountain, in 1780, by a sudden gathering of untrained backwoodsmen and hunters, chiefly from the mountain settlements, checked the victorious march of the British; and a similar volunteer gathering of her yeomanry from all the surrounding region at the battle of Guilford Court House, in 1781, contributed largely to give the victory of Cornwallis the character of a defeat, and forced his speedy retreat to the coast and ultimately to Yorktown for the final catastrophe.

On the formation of the Federal Union, North Carolina, having had abundant and long experience of usurpation and misgovernment, did not make haste to enter the new compact, but moved with slow and cautious steps, and was one of the last of the colonies to adopt the constitution. At the breaking out of the war between the States in 1861, North Carolina, strongly averse to secession, sought by every means to avert the conflict, remaining unmoved after all the surrounding States had seceded, and was forced into the struggle almost last of the Southern States, and when there remained only the alternative of a choice of sides. Being near the seat of war and yet for the most part outside of it, the State contributed more largely to the commissary supplies of the Confederacy, and also sent into the field a larger number of troops and lost more men in battle than any other State, her soldiers having a conspicuous share in all the great battles from Bull Run to Petersburg. Since the close of the war, which left her utterly bankrupt, North Carolina has entered on a career of prosperity unexampled in her previous history. Population has increased far more rapidly than at any previous period, the number of miles of railroad has been doubled, the area of land under cultivation enlarged, agriculture improved in its methods and results, and industries diversified to an extent and with a rapidity never known before.

NORTHCOTE, JAMES, historical and portrait painter, was born at Plymouth, England, on October 22, 1746. In 1769, he started as a portrait painter. Four years later he went to London, and was admitted as a pupil into the studio and house of Reynolds, who had been the object of his warmest admiration from early boyhood. He was elected associate of the Academy in 1786, and full academician in the following spring. He died July 13, 1831.

NORTH DAKOTA. A full description of the territory now included in the two Dakotas is given under the head of **DAKOTA** in Vol. III, pp. 1896, *et seq.* Both North and South Dakota were admitted to the

Union on Nov. 3, 1889. The boundaries of North Dakota are: north by Manitoba and the Northwest Territory; south by South Dakota, on the line of the 46th parallel; west by Montana, and east by Minnesota.

NORTHFLEET, a village and urban sanitary district in the county of Kent, England, is situated on the Thames and the North Kent Railway, twenty miles east of London. Population (1901), about 10,000.

NORTH SEA. The North Sea or German Ocean lies between Great Britain and the continent of Europe. It communicates with the North Atlantic by the Straits of Dover in the south, and by the Pentland Firth and the various openings between the Orkney and Shetland Islands in the north. Between the Shetlands and Norway it passes by a wide opening into the sub-polar basin, now generally known as the **NORWEGIAN SEA** (*q. v.*), of which indeed it may be regarded as a southern extension. It has communication with the Baltic by the Skagerrack and the Cattegat. The shores of the North Sea have from their earliest times been inhabited by brave and hardy races of men famous for their maritime exploits; and at the present day it is surrounded by many of the most prosperous and enterprising commercial nations, and is, in consequence, one of the most important highways of the world. Its fisheries give employment to thousands of persons, and are the most valuable that exist. Lighthouses are situated on nearly every available point where they are required, and there are numerous lightships along the coasts.

The North Sea has all the characteristic features of a great bay, and has a great abundance of plant life. Its surface or intermediate waters are at times quite discolored by the enormous abundance of Diatoms or Peridinias which are met with in vast floating banks. The cause of the rapid and great development of these minute organisms at particular times and places appears to depend on physical conditions which are not at present understood. With such a vast food supply it is not surprising that a prolific fauna swarms in the North Sea. Everywhere on the bottom we find foraminifera, sponges, coelenterates, echinoderms, worms, polyzoa, tunicata, molluscs, crustacea, and fishes. At all depths in the intermediate water we find protozoa, medusæ, copepods, amphipods, schizopods, sagitta, and various other pelagic animals, together with a great abundance of the larvæ of animals living on the bottom. The invertebrates living on the bottom and in the water at various depths, in their adult as well as in their larval stages, supply food for those fishes which are so much desired for the table. Most valuable food fish, as the cod, haddock, herring, sprat, halibut, sole, coal-fish, and many others, frequent the North Sea, and are captured in great numbers.

NORTHUMBERLAND, the northernmost county of England, is of a somewhat triangular form, roughly resembling that of England itself, and is in extremes about seventy miles long and fifty-three broad. Its area is 2,016 square miles, ranking it fifth among English counties. Northumberland lies entirely on the easterly slope of the country. Its boundaries are the German Ocean, Scotland, and the counties of Cumberland and Durham. In physical aspect it is a tumbled incline of fells and ridges, intersected by valleys and subsiding eastward from the hill-borders of Scotland and Cumberland into lessening undulations and a shelving coast. The Cheviot range (separating Northumberland from Scotland) is divided by nature into two groups. What may be called the northern Cheviots are green hills of conical and high-arched forms, finely grouped, with the peat-capped Cheviot itself (2,676 feet) at their center, deep, steep glens radiating into all parts of their mass, and generally more or less of hollow and inclosed

ground separating them from the slopes at their base. The southern Cheviots (southwestward from Thirlmoor) are the highest part of the county.

The chief rivers and valleys are the Derwent, the Irthing, the Tyne (with its North and South branches, the Allendale, and Redesdale), the Wansbeck with its twin the Font, the Coquet, the Alne, the Till with its feeders, the Breamish, Glen, and College, and the Tweed.

The coast is a succession of sands, flat tidal rocks, and low cliffs. Its bays are edged by blown sandhills; its borders are severely wind-swept. Several islands lie over against it. Holy Island, the classic Lindisfarne, 1,051 acres in extent, but half "links" and sandbanks, is annexed to the mainland and accessible to conveyances every tide. The Farne Islands are a group of rocky islets farther south—the scene of many saintly austerities, and of the nobler devotion of Grace Darling.

The main portion of the great northern coal-field that extends into Northumberland is an uneven triangle, with its base stretching fourteen miles inland from the mouth of the Tyne, and its apex on the coast twenty-four miles northward. There are eighteen or twenty seams of workable thickness, all of them of varieties known as bituminous or "caking" coal, amounting in the aggregate to nearly sixty feet in thickness. According to the mineral statistics the output of coal from the 176 collieries worked in Northumberland was 14,518,789 tons, as against 36,299,597 tons from the whole coal-field, and 156,499,977 tons from the United Kingdom. The net quantity of coal in Northumberland available for the future was estimated before the Coal Commission in 1870 as 2,576,000,000 tons, besides 403,000,000 tons under the sea within two miles of land. The rate of production is increasing annually.

The "lead-measures" in Northumberland chiefly lie in South Tynedale and Allendale, and belong to the Upper Limestone series or Yoredale rocks. The Cleveland ironstone and cheap foreign import have repressed iron-mining in Northumberland. Among other mineral products are building freestones in profusion; millstone grits, not at all restricted to the strata bearing the name; fireclays, chiefly of value among the Coal-measures; brick clays from glacial beds; and disintegrated shales.

Among the larger fauna of the county are the half-wild white cattle of Chillingham Park, the representatives, according to the best authorities, of the aboriginal cattle of the British forests, and degenerated descendants of the great Urus, or *Bos primigenius*.

The climate is bracing and healthy. In spring east winds prevail over the whole county. The lambing season in the higher uplands is fixed for the latter half of April, and is even then often too early. In summer and autumn west winds are general.

The population in 1881 numbered 434,086 persons, 215,882 males and 218,204 females—showing an increase since 1871 of 47,440 persons, and of 256,008 since the first census in 1801. Pop. (1901), 388,059.

Northumberland contains 1,290,312 acres. In the *Agricultural Returns* for 1883 the cultivated area of the county stands as 712,615 acres, exclusive of orchards and market gardens. The manufactures of this county chiefly come from the Tyne, which is a region of iron-works, blast-furnaces, shipbuilding yards, ropeworks, coke-ovens, alkali-works, and manufactories of glass, pottery, and firebricks, from Newcastle to the sea (see NEWCASTLE). The Tyne is the most productive salmon-netting river from a commercial point of view in England and Wales. The richness of its fisheries is mentioned in the time of Henry I. According to

Professor Huxley's report, the estimated catch in 1882 was 41,110 salmon and 10,336 salmon-trout. The pre-Roman antiquities of Northumberland are camps, cairns, standing-stones (both monoliths and fragmentary circles), sculptures on rock, hand-made pottery, and weapons, ornaments, etc., of stone, bronze, iron, jet, glass, and gold. In Roman military antiquities this is the premier county of Britain. For the great wall between the Tyne and the Solway, see HADRIAN'S WALL. The Roman road from London nearly bisects the county, and still goes familiarly under the name of "the Watling Street." It passes numbers of quadrangular camps, three of which were permanent stations. Its eastern branch, the Devil's Causeway, leaves it near the Tyne for Berwick. In the southwest of the county lay the Maiden Way, making for Liddesdale. Coal, iron, and lead appear to have been worked by the Romans. Numerous heaps of heavy iron slag, mingled with charcoal, are the sites of little "bloomeries" on the uplands. They may be of different ages, from that of the Britons downward.

NORTHUMBERLAND, KINGDOM OF. The history of Anglo-Saxon England is the history, not of a heptarchy of independent and equal or nearly equal kingdoms united by any kind of federal bond, but of the rise and progress of the kingdom of Northumberland from the end of the sixth to the middle of the eighth century under Ethelfrith and the descendants of Edwin of Deira, the predominance of Mercia during the latter half of the eighth century under Offa, and the gradual union of England under the descendants of Egbert of Wessex between the close of the eighth century and the Norman Conquest.

NORTHWESTERN PROVINCES, THE, a lieutenant-governorship of British India, lying between 23° 51' and 31° 5' N. latitude and between 77° 3' and 84° 43' E. longitude, is bounded on the north by Tibet, on the northeast by Nepál and Oudh, on the south by the Chutiá Nágpur districts of Bengal, Rewah, the Bundelkhand states, and the Central Provinces, and on the west by Gwalior, Rájputána, and the Punjab, with an area under British administration of 81,858 square miles. The administrative headquarters and seat of the lieutenant-governor are at Allahábád.

The Northwestern Provinces include the whole upper portion of the Gangetic basin from the Himálayas and the Punjab plain to the Vindhyan plateau and the low-lying ricefields of Bengal. Taken as a whole, the lieutenant-governorship consists of the richest wheat-bearing country in India. It contains many of the most famous cities of Indian history and is studded with thriving villages, interspersed at distances with large commercial towns. Except during the hot months, when the crops are off the fields, the general aspect is that of a verdant and well-tilled but monotonous plain, merging into hilly or mountainous country at the extreme northern and southern edges of the basin. Besides the three great rivers—the Ganges, Jumna, and Gogra—there are the following secondary streams, each with numerous minor tributaries:—The East and West Káli and the Hindan flow through the Doáb; the Chambal intersects the trans-Jumna tract; in Bundelkhand the principal streams are the Betwá and the Ken; the Rám-gangá, rising in Garhwál, pursues a very tortuous course through Rohilkhand; the Gumti enters the Provinces from Oudh, and flows past Jaunpur to join the Ganges; the trans-Gogra region is divided into two nearly equal parts by the Rápti. All the drainage of the country falls directly or indirectly into the Ganges.

The climate of the Northwestern Provinces as a whole may be classed as hot and dry.

The Northwestern Provinces contain a denser popula-

lation than any country of Europe, excepting Belgium and England. The census of 1901 returned the population of the British districts at 34,812,174 (males 17,110,901, females 17,701,273), distributed among 81,274 villages and towns. Including the two attached native states of Garhwál and Rámpur, the area amounted to 86,983 square miles, and the population to 35,461,878.

Most of the people are gathered into small villages. There are, however, no fewer than 238 towns with a population exceeding 5,000, and containing an aggregate of 3,513,107 inhabitants. No other part of India contains so large a proportion of celebrated cities, though recent changes have made over Delhi, the most famous of all, to the adjacent province of the Punjab. Thirteen towns contained in 1901 a population exceeding 50,000—namely, (1) Benares, 203,095; (2) Agra, 188,300; (3) Cawnpur, 197,000; (4) Allahábád, 175,748; (5) Braeli (Bareilly), 117,433; (6) Meerut, 116,642; (7) Sháhjáhanpur, 75,662; (8) Murádháb, 75,176; (9) Farrukhábad, 62,878; (10) Koil (Aligarh), 70,127; (11) Saháranpur, 63,850; (12) Gorakhpur, 63,059; (13) Mirzápur, 79,787. Eighteen towns contain a population of between 20,000 and 50,000.

Of a total area of 81,858 square miles, 38,169 were returned as under cultivation in 1881-82. Eleven great canal irrigation works have been undertaken by the government—(1) Ganges Canal, (2) Eastern Jumna Canal, (3) Agra Canal, (4) Dún Canals, (5) Rohilkhand Canals, (6) Bijnaur Canals, (7) Bundelkhand Lakes, (8) Lower Ganges Canal, (9) Bundelkhand survey, (10) Sardah Canal survey, and (11) Betwá Canal. The total area irrigated in 1881-82 by government works amounted to 1,395,217 acres. There are two principal harvests, in autumn and spring. The great agricultural staple is wheat. The chief commercial crops include indigo, cotton, sugar, oil seeds, and opium. The cultivation of tea is confined to the submontane districts of Kumáun, Garhwál and Dehra Dún.

The exports of the Northwestern Provinces are principally confined to its raw agricultural produce—wheat, oil-seeds, cotton, indigo, sugar, molasses, timber, and forest produce, dyestuffs, *ghí*, opium, and tobacco. The imports consist mainly of Manchester piece-goods, metal-work, manufactured wares, salt, and European goods. The Northwestern Provinces are under the administrative charge of a lieutenant-governor, who resides at Allahábád. The total revenue (including that of Oudh) in 1881-82 amounted to \$45,000,000, and the expenditure to \$21,500,000. The chief item of receipt is the land-tax, which produced during the same year \$28,500,000. Education is making steady progress throughout the central Gangetic plain, though still very backward in the Himáláyan districts, in Bundelkhand, and in the remoter parts of Rohilkhand and the trans-Gogra tract. The total number of colleges and schools in the Northwestern Provinces in 1881-82 was 5,063, with a roll of 170,966 pupils, of whom 142,190 were Hindus and 24,437 Mohammedans. The principal institutions for higher English education are the Muir Central College at Allahábád, and the Government and Church Missionary Society's Colleges at Agra. The Benares College gives high Sanskrit education, while Delhi College, just beyond the borders, gives instruction in Arabic and Persian. Primary education is afforded by a complete system of village schools, the provinces being divided into three circles of inspection, and elementary instruction is now brought within easy reach of all who choose to avail themselves of it.

The traditions of the *Mahábhárata* cluster around the city of Hastinapur in Meerut district, which, with Indraprastha, whose shapeless ruins are still to be seen

near Delhi, formed the respective capitals of the Pandavas and Kauravas. The earliest empire in this part of India, however, of which any certain monuments remain, was that of the Buddhist dynasty of Magadha, which attained its greatest development under Asoka.

Continuous history begins with the Mohammedan invasion of Mahmúd of Ghazni, who sacked the sacred cities of Kanauj and Muttra in 1017 A.D. Mohammed Ghori, however, was the real founder of the Moslem power in Hindustán. In 1193 the seat of the Moslem empire was fixed at Delhi, where it remained, with few intermissions, till the British conquest.

The British first came into connection with the Northwestern Provinces as they advanced along the valley of the Ganges from Bengal. In 1763 the nawáb wazír of Oudh, with the phantom emperor Sháh Alam, invaded Bengal. They received a crushing defeat at Baxar, and the emperor, with Balwant Singh, rájá of Benares, joined the British camp. In 1775 the nawáb of Oudh, Asaf-ud-daulá, ceded Benares, Jaunpur, and Gházipur to the British, retaining Allahábád and Korah, which had been taken from the emperor in the previous year, when the British sold them to Oudh.

The nawáb wazír, having agreed to pay a subsidy for the English troops maintained for his aid, and being always in arrear, signed, in 1801, the treaty of Lucknow, by which he made over to the British the whole of his Oudh dominions in the Doáb, together with Rohilkhand. For Lord Lake's campaign in 1803 against Sindhia, which brought the whole remaining portion of the Northwestern Provinces under British rule, see INDIA. The Himáláyan districts of Kumáun and Garhwál were not acquired until after the Gúrkha war of 1814-15, while the Delhi territory remained the personal appanage of the Mughal royal family until 1832, when it passed to the direct government of the East India Company.

NORTHWESTERN TERRITORIES (of Canada), a group of four districts, organized in 1882, out of the territories of the Hudson Bay Company, known as Rupert's Land, and acquired in 1870 by the Dominion of Canada. Area, 555,640 square miles; population (1901), 158,940; capital, Regina, on the line of the Canadian Pacific Railway, 357 miles west of Winnipeg. The districts lie in the great ranching and grain belt west of the province of Manitoba, and east of the Rocky Mountains and the province of British Columbia. The Northwestern Territory was at first a vague term designating all that portion of British North America which lay to the northwest of the old Canadian provinces of the St. Lawrence basin. The extent of this territory is estimated at two and one-quarter million square miles. In the British North America Act, of 1867, which constituted the Dominion, provision was made for the admission of this territory, and out of it, in 1870, the Prairie Province of Manitoba was carved. The original limits of this Province were from the international boundary line, 49° to 50° 30' N. latitude, and from 96° to 99° W. longitude. In 1881 the limits were extended north to 52° 30' and west to 101° 20'. In 1876 the district of Keewatin (area about 750,000 square miles), stretching from the northern limits of Manitoba to the Arctic Ocean, was constituted and placed under the jurisdiction of the Prairie Province. The vast plains to the west of Manitoba were then (in 1876) set apart into four districts or embryo provinces, and were at first governed by Manitoba. In 1882 these districts were placed under the administration of a lieutenant-governor and a council of five members, subject to instructions given by order in council or by the Dominion. Regina became the seat of local government. Subsequently (in 1888), by 51 Vic., cap. 19, a legis-

lative assembly was created for the Northwestern Territories, having the same powers and performing the same duties as the former Northwestern Council. The assembly is composed of twenty-two members, representing electoral districts, with three legal experts, appointed by the governor in council. Still more recently these Northwestern Territorial Districts have been given representatives in the Dominion parliament, the Senate having two members and the House of Commons four members. Of the latter, Alberta and Saskatchewan send one representative each, while Assiniboia sends two. The district of Athabasca has as yet no representation. The location and area of these four districts are as follows:—(1) Assiniboia (90,340 square miles), which lies west of Manitoba between 101° 20' W. longitude and the line dividing the tenth and eleventh ranges of townships of the Land System Survey, and is bounded on the north by the ninth correction line (near 52° N. latitude). The chief towns in the district, which lie on the line of the Canadian Pacific Railroad, are Broadview, Qu'Appelle, Regina, Moose Jaw, Swift Current, and Medicine Hat; (2) Saskatchewan (114,000 square miles), lying north of Assiniboia and extending to about 54° N. latitude, with the same western boundary as Assiniboia. Its eastern boundary is the Nelson River and Lake Winnipeg. The chief towns of the district are Prince Albert and Battleford; (3) Alberta (100,000 square miles), which includes all the territory west of Assiniboia and Saskatchewan as far as the boundary of British Columbia. Its chief towns are Edmonton, Calgary, Banff, and Fort McLeod; (4) Athabasca (251,300 square miles), embracing the country due north of Alberta as far as 60° N. latitude. There are no towns in this latter district. The vast region to the north of the districts of Saskatchewan and Athabasca, watered by the Great Bear Lake, Great Slave Lake, and the Coppermine and Mackenzie Rivers, is politically unorganized. East of this region of solitude lie Keewatin and the inland sea of Hudson Bay. East of this, again, is a region known as the Northeast Territory, which is shut in from the Atlantic by Hudson Strait, Labrador, and the eastern portions of the Province of Quebec. The vast spaces in these unorganized territories are roamed by diminishing bands of Indians and Esquimaux, whose occupations are trapping, hunting, and fishing. The Hudson Bay Company maintain still a few trading-posts in the territory, the chief of which is York Factory on Hudson's Bay, at the mouth of the Nelson River. The resources of the organized districts of the Northwest Territories proper are enormous. They are chiefly agricultural and pastoral, with a little coal-mining. Assiniboia and Alberta are served by the Canadian Pacific Railway, which traverses these two districts. The Saskatchewan is served by the two branches of the great river of that name, whose outlet is in Lake Winnipeg. Nearly one-half the population of the organized districts of the Northwest Territories is Indian or halfbreed. The unorganized territories of Canada embrace besides Yukon, Mackenzie, Ungava, and Franklin, with a total population (1901) of 52,709.

NORTHWICH, a market-town of Cheshire, England, is situated at the confluence of the rivers Weaver and Dane, eighteen miles northeast of Chester and twenty-two southwest from Manchester. The streets are narrow and irregular, and many of the houses are screwed and bolted together to keep them secure from subsidences arising from the dissolving of the salt strata (180 feet in thickness), caused by the pumping of brine for the purpose of evaporation. Salt springs in Northwich were known to the Romans. By the Britons it was called the Black Salt Town. The substratum of rock-salt upon which

the town rests was first discovered in 1670. It consists of two beds, a lower and an upper, which lie horizontally, the lower about 330 feet from the surface. In the lower stratum there exist several mines in the neighborhood of the town. From two of these, each forty acres in extent, the rock-salt is produced. The average quantity of salt exported from the town annually amounts to over 500,000 tons. The population of the urban sanitary district (area 1,920 acres) is 12,246.

NORTON, HON. MRS. CAROLINE ELIZABETH, afterward Lady Stirling-Maxwell, ranks high among the women of letters of the nineteenth century. She was born in 1808. One of the three beautiful granddaughters of Sheridan, daughters of his son Thomas, "three Graces" of London society in the reign of George IV., she showed literary ambition and faculty before she was out of her teens. Her first publication, made at the age of seventeen, was a merry satire, *The Dandies' Rout*, illustrated by herself, full of girlish high spirits and wit. Her first essay in serious verse was made in 1829 with *The Sorrows of Rosalie*, the next in 1831 with *The Undying One*, a version of the legend of the Wandering Jew. She made an unfortunate marriage, in 1827, with the Hon. George Norton, brother of Lord Grantley; then, after three years of protests on her part and good promises on his, she had taken the decisive step of leaving his house for her sister's, had "condoned" on further good promises, and had returned, to find matters worse. The husband's unmanly persecutions culminated, in 1836, in an action brought against Lord Melbourne for seduction of his wife, which the jury decided against Mr. Norton's claims without leaving the box. Mrs. Norton made her own unhappy experience a plea for addressing to the queen, in 1855, an eloquent letter on the law concerning divorce, and her writings had considerable influence in ripening opinion for recent changes in the legal status of married women. During the reign of William IV., Mrs. Norton was at the height of her literary reputation, contributing many criticisms, sketches, tales, and songs to various periodicals and annuals, and using pencil as well as pen. Mrs. Norton's last poem was the *Lady of La Garaye* (1861), her last publication the half-humorous, half-heroic story of *The Rose of Jericho*, in 1870. She died on June 14, 1877. Mr. Norton died in 1875; and Mrs. Norton in the last year of her life was married to Sir W. Stirling-Maxwell.

NORWALK, a township in Fairfield county, Conn., on Long Island Sound, forty-three miles northeast of New York, at the terminus of the Danbury and Norwalk Railroad. It contains the borough of Norwalk, dating from 1836, and the city of South Norwalk, incorporated in 1870, the population being 6,000. Vessels drawing six feet of water ascend the Norwalk river at low tide, and there is regular steamboat communication with New York. Norwalk was settled about 1640 and incorporated as a town in 1653. The population in 1900 was 6,125.

NORWALK, a post-village of Ohio, the capital of Huron county, fifty-eight miles east of Toledo by the Lake Shore and Michigan Southern railway and is also on the Wheeling and Lake Erie railroad, is a flourishing place of 7,074 inhabitants (1900), containing planing-mills, grist-mills, manufactories of sewing-machines, organs, carpet-sweepers, and shoes, and breweries.

NORWAY comprises the western and northern divisions of the Scandinavian peninsula. It is bounded north by the Arctic Ocean, west by the Norwegian Sea and the North Sea, south by the Skagerrak, and east by Sweden, Finland, and Russia. The length of the coast-line, exclusive of fjords, bays, and islands, is 3,018

miles, and the area 122,780 square miles. The country, which has its greatest breadth, 280 miles, at the sixty-first parallel of latitude, is comparatively narrow, measuring only seventy miles across between the sixty-fourth and the sixty-eighth parallels. The Scandinavian peninsula constitutes for the most part a rocky region, of which the loftiest tracts lie on the Norwegian side. The interior of Finnmark, the most northerly district of Norway, has no considerable heights; but the frontier between Sweden and Norway, from Tromsø stift to the southern part of Thronthjem stift, is marked by a continuous mountain range, called Kjölen (the keel), which, geologically, extends in lower levels still farther south as the frontier between the two countries. In this range are specially conspicuous the alpine regions occupying the interior of Tromsø stift, with peaks reaching a maximum altitude of 5,475 feet—the ice-clad tract of Sultjelma east of Salten Fjord (6,178 feet), the heights east of Thronthjem Fjord (4,560 feet), and those east of Röros (4,680 feet). The narrower part of the mountain mass occurs on the side of the ridge facing the Norwegian Sea, the broader part on that facing the Baltic and its arms. In the latter direction, *i.e.*, eastward, the surface of the country presents a comparatively uniform slope, alike in Sweden and in the part of Norway lying south of the Dovre Fjeld and east of the Lang Fjelde.

In Norway the mountainous region constitutes chiefly a vast plateau extending wellnigh over the whole country. From this tableland rise the summits of the mountains, and the rocky mass itself is intersected by wide fissures, forming valleys, lakes, and fjords. The roads across the mountain ridge traverse the valleys, and hence can afford no standard by which to measure its height. Its elevation is estimated at from 2,000 to 4,000 feet in different localities. Such parts of the country as may justly be entitled plains (as, for instance, Romerike in east Norway, and Lister and Jæderen on the southwest coast) are exceedingly limited as to both number and extent. Hence the rivers are navigable only for short distances, and even then only exceptionally by large vessels. It is only in those comparatively frequent cases where the rivers expand into lakes that they can, strictly speaking, be navigated by ships. On the other hand, the waterfalls in Norway are exceedingly numerous, and many of them remarkable for their height, body of water, and great beauty.

The freshwater lakes of Norway must be generally regarded as mere river expansions. Hence they are, as a rule, long and narrow, and, to judge from the soundings hitherto made, exceedingly deep. The total surface area of all the freshwater lakes of Norway is estimated at 2,930 square miles, or 2.38 per cent. of the area of the land.

The numerous and in many cases very extensive fjords, as well as the height and contour of the country, give to the different parts of the coast of Norway a remarkably varied character. For long distances the mainland does not come into direct contact with the sea, girdled as it is by a belt of islands, holms, and skerries, more or less thickly set, which forms the so-called "skjærgaard" (fence of skerries) or outer coast. Between this wall of islets and the mainland, accordingly, extends a connected series of sounds—"leder" (roads), as they are called—of the greatest importance for coastal navigation, since they admit of the employment of smaller and weaker vessels. The total area of the islands of Norway amounts to 8,460 square miles.

Notwithstanding its great abundance of rocks, Norway cannot be said to be rich in valuable ores or minerals. Thus, for example, true coal does not occur; Jurassic has been found on Audöen, but only in seams

extremely limited in extent. Gold is met with very sparingly in veins of quartz at Eidsvold, in the rivers of Finnmark, and along with silver in the Kongsberg mines. The latter metal is found as native silver in veins of calcareous spar at Kongsberg, where the state owns a silver mine of considerable value. Copper occurs in numerous localities, as Thelemark, Röros in the Thronthjem district, many parts of the west coast, more especially at Vigsnaes on Karmöen, and in northern Norway at Kaasfjord in Alten. Nickel is produced in some parts from sulphureted iron ore, particularly on the island of Senjen in Tromsø amt. Iron ores are met with in southern Norway, particularly along the coast near Arendal.

Volcanoes, in a strict sense, and their subsequent results, such as hot springs, have not been met with in Norway.

The coldest parts of Norway, where the mean annual temperature is below 32° Fahr., are the highest regions of the country and the interior of Finnmark (Karasjok, 26.4°); on the seashore it is only at Varanger Fjord that it falls below 32°. The highest mean annual temperature (44.6°) is that of Skudesnaes; and the outer coastal margin from the mouth of Sogne Fjord to Lindesnaes has a mean annual temperature of 44°. The interior of southern Norway and that of Finnmark have the longest winter (200 days with a mean annual temperature of under 32°) and the lowest winter temperature, the mean temperature of the coldest day being under 14°. From the interior districts toward the coast the climate becomes everywhere milder in winter. Storms are frequent on the coast (thirty stormy days a year), rare in the interior (four stormy days a year). Their most frequent direction is the same as that of the prevailing winds, *viz.*, for the whole country on an average from the southwest, then from the west, and the northwest. They are most frequent in winter, particularly during December and January (four a month), rarest in summer (hardly one a month). Fog is most frequent on the west coast and the coast of Finnmark in summer, rarest in winter. In the southeast part of the country the reverse is the case. In winter a frosty fog hangs over the inner extremities of the fjords when the cold is severe and the wind blows out from the land over the open water of the fjord.

The forest growth of Norway consists chiefly of pine and fir, which clothe the slopes of the mountain valleys, especially in northern Norway (as those of the Glommen and its tributaries, those of the Drammen, Laurvik, Skien, Arendal, and Christiansand districts, and those drained by the rivers disemboguing at Frederikshald). Extensive forests of coniferous trees are also found in Thronthjem stift and the amt of Nordland. The coniferous woods of Bergen and Tromsø stifts consist—with a solitary exception—of fir alone. The extreme limit of the fir belt in southern Norway is from 2,200 to 3,000 feet above the sea; throughout the Thronthjem region, from 1,600 to 2,000 feet; at Talvik in Alten (70° N. latitude) it does not exceed 700 feet. With the sole exception of the birch, none of the foliferous trees indigenous to the country form woods of great extent.

The vast fir and pine forests are still the haunts of the largest of European carnivora—the bear, the lynx, and the wolf. The numbers of the last-mentioned, however, have, in southern Norway, been steadily and one may almost say unaccountably decreasing during the last twenty years; and the wolf may be now regarded as the most rare of all Norwegian beasts of prey. In Finnmark it still abounds, constituting the worst enemy to the herds of reindeer. The bear also is less frequently met with, a fact to be accounted for by the immense quantities of timber felled of late throughout the country.

The elk is not found in the west of Norway, but its place is partially taken by the red deer, which selects as its haunts the largest of the wooded islands on the coast and the numerous semi-insular projections of the mainland. The wild desolate wastes of the fields are the home of the glutton and the reindeer, the lemming and the polar fox. Large herds of reindeer still roam throughout the alpine region of the fjelds between eastern and western Norway, and on the Dovre mountains, the Rundane, and the highlands between Gudbrandsdal and Østerdal, and Gudbrandsdal and Valdres; but this noble animal has become scarcer of late years. In some years, and in certain localities, the lemming makes its appearance in countless multitudes, to be attacked by its numerous enemies, particularly birds of prey, among which are the snowy and the short-eared owl; the common kestrel, too, and the rough-legged buzzard, are seen in large numbers at such times, sweeping over the wastes of the fjelds.

The sea that washes the shores of Norway abounds in fish; and hence the coast, with its numberless islands, holms, and skerries, is a favorite haunt for such birds and mammals as prey upon fishes and other marine animals. When the herring approaches the coast to spawn, it is hotly pursued by the whale; and in Finmark when shoals of capelan make for the coast in spring, accompanied by cod, which gorge themselves with this their favorite food, the fin-whale and the blue-whale are exceedingly numerous, and their presence has given rise to a most important branch of the fishing industry. The waters of the fjords, and the holms and islets of the coast abound in the spotted seal (*Phoca vitulina*), and the *Phoca barbata* is not uncommon in some localities on the outermost skerries.

Feathered game—capercailzie, black-cock, hazel grouse—is still abundant in the forests, though less plentiful now than formerly, owing to the reckless manner in which they have been destroyed by amateur sportsmen. The finest ptarmigan are found in the birch region of the fjelds; but in southern Norway they often prefer the more elevated tracts of the willow zone during summer, though even then they are most abundant in the birch zone. The marshy tracts of the fjelds are the breeding-grounds of numerous varieties of fen-fowl, the lapwing and the dotterel plover occurring in great numbers.

Of the various species of freshwater fish the *Salmonidae* are beyond comparison the most important to the inhabitants. In the more extensive of the lakes, which are generally of great depth, trout attain almost the size of salmon, weighing up to thirty pounds. In some lakes the red charr attains a weight of twelve pounds, as does also the Finmark variety of this fish, which, in common with the sea-trout, remains during most of the year in deep sea-water, ascending the rivers in the spawning season only.

The sea being very deep, both in the fjords and off the coast, such fishes and marine animals as affect great depths are there abundant. Some species are of great economic importance. On the banks off the coast of Finmark, at a depth of 150 to 200 fathoms, large numbers of the Greenland shark are annually captured, their livers yielding a large quantity of oil. During the first half of the present century the sunfish, or basking shark, abounded on the coast, its capture forming an important branch of the fishing industry. It is now but rarely met with, and the fishery has been discontinued. No species of fish can compare in point of importance with the herring and the cod, which, taken in immense quantities on the western coast, constitute one of the chief sources of national wealth.

The population of Norway on December 31, 1882, 283

was 1,913,000, and is now (1900) 2,239,880. Subjoined are the populations of each of the eighteen counties (amter) into which the kingdom is divided:—

Smaalenene.....	136,886	Stavanger.....	127,592
Akershus.....	116,228	Søndre Bergenhus..	135,752
Buskerud.....	112,676	Nordre Bergenhus..	86,041
Jarlsberg and Larvik	104,554	Romsdal.....	136,137
Bratsberg.....	99,052	Søndre Thronhjelm	135,382
Hedemarken.....	126,182	Nordre Thronhjelm	83,433
Christians.....	116,280	Nordland.....	152,144
Nedenes.....	79,935	Troms.....	74,362
Lister and Mandal..	81,567	Finmarken.....	32,800

Of the towns the following eight had the largest population (Christiania and Bergen being each a separate amt):—Christiania (1900), 227,626; Bergen, 72,251; Thronhjelm, 38,180; Stavanger, 30,613; Drammen, 23,093; Christiansand, 14,666; Christiansund, 12,050; and Fredrikshald, 11,957.

Norway is the most sparsely populated country in Europe, having an average of about eighteen persons to the square mile. According to the returns completed in 1875, the owners of real property in the rural districts numbered 173,183. An area of 24,713 English square miles of the southern stifts is estimated to be under wood, while the whole arable land of the country in 1875 amounted to 738 square miles.

The fisheries form one of the most important sources of the national wealth. In 1900 they employed upward of 94,000 men, and the aggregate profits were estimated at about \$6,000,000.

Manufacturing establishments numbered 2,628, employing an aggregate of 41,391 hands. The leading place here is taken by the sawmills, of which there were 112 driven by steam (3,402 hands) and 630 by water (4,274 hands). Next come 551 cotton-mills (2,037 workmen), 199 brickworks (3,540 workmen), 123 cod-liver-oil works (598 workmen), 112 shipbuilding yards (2,388 workmen), and 27 wood-fiber factories (805 workmen).

Mines are a considerable source of wealth to the country. The foreign trade of Norway is steadily increasing. Its aggregate value in 1882 was estimated at \$80,000,000. The port of Christiania has the largest trade; next to Christiania come Bergen and Thronhjelm. The mercantile marine of Norway some years ago passed through a period of stagnation, but revived somewhat. In 1889 it consisted of 7,977 vessels (7,618 sailing-vessels and 359 steamers), with an aggregate tonnage of 1,520,407. The gross freight earned was \$26,000,000. The largest shipping ports are those of Stavanger (669 vessels, 120,017 tons), Arendal (412 vessels, 171,858 tons), Bergen (348 vessels, 84,870 tons), Christiania (318 vessels, 105,193 tons), and Drammen (281 vessels, 85,028 tons).

The Norwegian railways have a total length of 1,231 English miles. With improved means of communication the Norwegian postoffice has made corresponding advances. The government telegraphs had at the close of 1900 a line length of 7,460 miles.

As regards primary education Norway takes a leading place among the states of Europe. In the country districts 257,922 children were instructed in 6,008 schools by 3,374 teachers and 108 preceptresses; 40,826 children in the towns were instructed by 372 teachers and 367 preceptresses in 144 schools. There are, besides, 147 citizen-schools, middle schools, and higher schools, with a staff of 824 teachers and 466 preceptresses; the scholars numbered 16,800 (9,150 boys and 7,650 girls). The university, that of Christiania, has 50 professors and 1,400 students.

Service in the army or navy, without the right of providing a substitute, is obligatory on all males who have completed their twenty-third year; the only exemptions

are in favor of ecclesiastical functionaries, pilots, and the inhabitants of Finnmark. To the navy are drafted all conscripts who have made a voyage to foreign parts of at least twelve months, all conscripts from Nordland and Tromsø, and a certain number of those from southern Norway who are accustomed to the sea. The military schools are at Christiania. The average annual conscription is 6,300 men. The total establishment of the army in 1900 was 30,809 men, viz., infantry 20,672 (18,275 combatants), cavalry 2,735 (1,343 combatants), artillery 5,150 (2,867 combatants). The commissioned officers numbered 703. The numbers on a peace footing were—for the line 15,878 (war complement 3,203), for the reserve 30,089, for the *landværn* 20,000. There were also 532 musicians.

The navy is manned in part by volunteers. The term of service is from the age of twenty-two to that of thirty-five. The schools for naval instruction are at Horten, where also is the chief royal dockyard. The fleet consists of 49 steamers with 157 guns. There is also a torpedo service.

The constitution of Norway primarily rests on the "fundamental law," or *grundlov*, which was promulgated at Eidsvold on May 17, 1814, and afterward, on the union with Sweden, agreed to, with slight modifications, in Christiania on November 4th in the same year. To this must be added the Swedish succession ordinance of September 26, 1810, accepted by Norway in November, 1814, and the *rigsact*, or charter of union, of 1815. By the first-mentioned Norway is a free, independent, indivisible kingdom, united with Sweden under the same king. The form of government is a limited monarchy, and the throne is hereditary in the male line. Evangelical Lutheranism is the established religion. In their foreign relations the two kingdoms are regarded as one. The one cannot make war without the other, and there is a common diplomatic corps, which is controlled by the ministry of foreign affairs in Stockholm. In all other respects each kingdom is regarded as sovereign and independent. The executive is vested in the king, who comes of age when he is eighteen. His person is inviolable, and all responsibility for his official acts rests with the council of state. This body consists of two ministers, and at least seven (at present nine) councilors, chosen by the king from among the citizens, of at least thirty years of age. Formerly the government in Christiania was presided over by a governor, but this office was never filled after 1855, and in 1873 it was abolished, (on the accession of Oscar II.) Each of the seven councilors has charge of one of the seven state departments (finance, justice, home affairs, church, war, navy and postoffice, and audit). The king can declare war and conclude peace, make alliances and treaties, and has the supreme command of army and navy; but for offensive war the consent of parliament is necessary. The king appoints to all public offices, and can dismiss at pleasure his council of state and other government functionaries, the highest officials of church and state, the heads of the army, and the commandants of fortresses. He can also issue provisional ordinances relating to trade, taxation, industry, and legal procedure, provided they are not contrary to the fundamental law of the country and the laws agreed upon by parliament; these ordinances are in force till next meeting of parliament.

While the king has thus the executive power, the right of legislation and taxation is exercised by the people through their representatives in the parliament or *storting*, which statedly meets in Christiania in the beginning of February every year. The king can, however, when circumstances require it, summon an extraordinary *storting*. The elections are for a period of

three years. The number of members is, by a law passed in 1878, fixed at 114—thirty-eight from the towns and seventy-six from the country. The members are not chosen directly, but by electors nominated by the voters. Several little towns are grouped into one electoral district. In the country there is an elector for every 100 voters in the parish (*herred*). The electors afterward meet in each county, and choose the number of members fixed by law. Only citizens who have the right to vote are eligible, and they must, moreover, be at least thirty years of age and have been ten years settled in the country. Every Norwegian citizen, not being a criminal or in foreign service, is entitled to vote, if he has passed his twenty-fifth year, has been settled in the country five years, and has certain property qualifications—a public appointment, ownership or tenancy of land, or, in towns, ownership of property worth at least 600 crowns (about \$165).

Immediately after the opening of parliament one-fourth of its members are elected to constitute the "upper house" or *lagthing*; the remaining three-fourths form the "lower house" or *odelsting*. In practice this means a division between the legislative and controlling powers of parliament. Every bill or proposed enactment must be introduced either by a member or by government through a councilor in the *odelsting*. If it passes it is sent to the upper house, and if carried there also the royal assent gives it the force of law. If rejected by the upper house it goes back, with or without remark, to the lower house, where it is again discussed. If again carried it is sent once more to the upper house, and if it fails to obtain the requisite majority of votes the whole parliament now meets, and two-thirds decide the motion. To give legal sanction to a resolution of parliament thus carried the royal assent is still required.

The royal veto in ordinary questions is not absolute; a resolution passed unchanged by three successive regular parliaments becomes law *ipso facto*; but it is otherwise where alterations in the fundamental law are involved. Parliament also fixes taxation, its enactments with regard to which continue in force only until the 1st of July of the year in which the next ordinary parliament meets. Parliament alone has control of the members of the council, of the supreme court of justice, and of its own members; for crimes in their public capacity these can be put on their trial at the instance of the lower house before the supreme court of the kingdom (*rigsretten*), which is composed of the supreme court of justice and the upper house of parliament. The proceedings of parliament and of its divisions are carried on, when not otherwise determined by special vote, with open doors, and published. The members of the council are not allowed to take part in the proceedings. By the fundamental law Norwegians only, with a few exceptions, are eligible for public appointments. The public debt in 1901 was \$58,669,000.

The early history of Norway is exceedingly obscure. The scanty allusions to Scandinavia and its inhabitants which we find in the classical writers refer to the inhabitants of Denmark and of the south of Sweden. The first mention of names which can be identified with any certainty as those of known Norwegian tribes is found in Jordanes, a writer of the sixth century. The traditions of the earlier times which are preserved in Norse literature can scarcely be said to afford any sure ground for history, for whatever truth may be in them seems to be almost hopelessly concealed beneath an overgrowth of mythological and genealogical legend.

Toward the end of the eighth century we first hear of that phase of history which made the Scandinavian peoples well known during the next 200 years to the

nations of northwestern Europe. In 787, if we may trust a record of later date, the ships of the Northern sea rovers first appeared on the English coast, and in 793 and 794 they plundered Lindisfarne and Monkwearmouth. Thenceforward we find them in continually increasing numbers on the coasts of Scotland and Ireland, in England and France, and on the southern coasts of the North Sea, isolated expeditions going as far as Spain and the Mediterranean.

About the end of the ninth century Norway first became a united kingdom, and from that time we have a comparatively full and authentic record of its history.

From the time of the union with the Swedish crown the history of Norway is bound up with that of the other Scandinavian countries. With Sweden she entered the Calmar union in 1397, but when that union was broken in the beginning of the sixteenth century she remained with Denmark, and during the whole time of union can scarcely be said to have had a history of her own. The Danish kings were accepted in Norway with only an occasional show of dissent and resistance. One of her oldest and most famous colonies, the Orkney and Shetland Islands, was, in 1468, given in pledge, never to be redeemed, to the Scottish king by Christian I. The commercial towns fell under the iron rule of the Hanseatic League, and all the old enterprise seemed to have perished. Intellectual life appeared to fall as low as commercial prosperity. The vigorous Norse-Icelandic literature was supplanted after the time of Hakon Magnusson by versions of foreign legends and history, but even that disappeared, and, as the manuscript copies grew scarcer, it appears as if for awhile the Norwegians had ceased to read as well as to write. The Reformation spread more slowly into Norway than into the other Scandinavian countries, and had to be encouraged by the Danish kings by methods not altogether dissimilar to those by which Christianity had at first been introduced. But better times began to dawn during the last century. Restrictions were removed from lands and the administration was improved. The material prosperity of the country rapidly increased and a new life began to appear.

By the terms of the peace of Kiel (January 14, 1814), Norway was to be transferred from Denmark to Sweden. The Norwegians were at first inclined to resist this, but their means of resistance were small and the Swedes offered liberal terms. In the same year the constitution was solemnly ratified, and Charles XIII. was taken as king. Since then the country has been peaceful and prosperous. The only serious political troubles have been those arising from the question whether the king has an absolute veto upon alteration of the fundamental law of the kingdom.

NORWEGIAN SEA. The sub-polar regions of the Atlantic lying between the Scandinavian peninsula and Greenland have been in recent years carefully investigated by Norwegian expeditions under Professors Mohn and Sars; and, as the sea immediately to the west of Norway has not hitherto been known by any distinctive name, Mohn has proposed the name of "Norwegian Sea"—a suggestion which has been now generally adopted. The Norwegian Sea, therefore, includes the whole of the region between Greenland and Norway, a portion of which, to the northwest of the island of Jan Mayen, is sometimes known as the Greenland Sea. The Norwegian Sea is a well-marked basin cut off from the Atlantic by submarine ridges connecting the north of Scotland, the Faroe Islands, Iceland, and Greenland. On the summit of these ridges there is an average depth of about 250 fathoms. Between Spitzbergen and Lapland there is a wide opening into the Barents' Sea, where the depth is from 100 to 200 fathoms.

Between Spitzbergen and Greenland a wide and deep opening extends into the frozen Arctic Ocean, with a depth of 2,500 fathoms. The surrounding land is almost everywhere high, rugged, deeply indented with fjords, and skirted with outlying islands, which are mostly composed of stratified rocks and ancient geological formations. Jan Mayen, situated near the center of the basin, Iceland, and the Faroe Islands are of volcanic origin.

NORWICH, a city of England, the capital of Norfolk. The municipal and parliamentary boundaries inclose an area of 7,472 acres; but the ancient walls (1294-1342), some portions of which remain, with their twelve gate-houses—the last demolished in 1808—were only four miles in circuit.

The textile manufactures of Norwich, once so important, have declined; and now its great industrial establishments are a mustard and starch works employing upward of 2,000 hands, three or four large breweries, and ironworks. Boots, clothing, vinegar, and agricultural implements are also made in large quantities. There is one daily paper, and eight others are published weekly. The corporation consists of a mayor, deputy mayor, and sheriff (elected annually), sixteen aldermen, and forty-eight councillors; and the city has sent two members to parliament since the reign of Edward I. The population has been successively (1801) 35,832, (1831) 61,110, (1871) 80,386, (1901) 111,728,—males, 55,228; females, 56,500—in 22,764 houses (1901).

NORWICH, one of the county seats of New London county, Conn., lies sixteen miles from Long Island Sound, at the junction of the Yantic and the Shetucket to form the Thames, and thirteen miles north of New London. The greater part of the city is built on rising ground between the valleys of the confluent streams, and with its white and handsome houses has a highly picturesque effect. Besides the courthouse (1873), used for county, township, and city affairs, the more conspicuous edifices are the free academy (1856), the Park Church (Congregational), and Christ Church (Episcopalian). Among the numerous industrial establishments settled at Norwich, on account of the abundant water-power in the district, are cotton, wool, paper, and rolling mills (all on a very large scale), as well as factories for firearms, printing-presses, water-wheels, locks, stoves, belts, bolts, wood-type, carriages, etc. Steamers ply daily between the city and New York, and there is a thriving trade in coal, lumber, and general goods. The population of the town was 14,048 in 1860, 16,653 in 1870, and by the twelfth census (1900) the total population was 17,251.

NORWOOD, a large suburban district of London, county of Surrey. It is divided into Upper, Lower, and South Norwood, all consisting principally of villa residences and detached houses inhabited by the better classes. The population of Norwood (area 1,009 acres) in 1871 was 12,536, and in 1901 was 30,000.

NORWOOD, a municipal suburb of Adelaide, South Australia, is situated about two miles northeast of the center of the city, with which it is connected by a tramway. Norwood along with Kensington forms a municipality, with an area of one and one-half square miles and a population of 18,000.

NOSE. See **SNELL.**

NOSSI-BÉ, an island off Passandava Bay, on the northwest coast of Madagascar, is situated 149 miles from Mayotte, and governed along with the smaller island of Nossi-komba, by a French commandant subordinate to the governor of Mayotte. Nossi-bé has an area of 83,200 acres (nearly 130 square miles), of which not more than 1,800 or 2,000 acres are planted with sugar-cane, coffee, etc. The population, consisting

mainly of Sakalava, varies considerably in number. Hellville, the European chief town (so called after De Hell, governor of Réunion at the time of the French annexation), has from 1,200 to 1,500 inhabitants.

NOSTRADAMUS, the assumed name of MICHEL DE NOTREDAME, a French astrologer, who was descended from a family of Jewish origin, and was born at St. Remi in Provence, December 13, 1503. After completing a course of study in humanity and philosophy at Avignon, he entered the school of medicine at Montpellier, where he eventually took the degree of doctor of medicine in 1529. Shortly afterward he settled at Agen, and in 1544 he established himself at Salon near Aix, in Provence. Both at Aix and at Lyons he acquired great distinction by his devoted and skillful labors during terrible outbreaks of the plague, and he was already well known before he appeared in the character of a seer. In 1555 he published at Lyons a book of rhymed prophecies under the title of the *Centuries*, which secured him the notice of the superstitious Catherine de' Medici of France; and in 1558 he published a second and enlarged edition with a dedication to the king. The seeming fulfillment of some of his predictions greatly increased his influence, and Charles IX. named him his physician in ordinary. He died July 2, 1566.

NOTARY, or NOTARY PUBLIC. In Roman law the *notarius* was originally a slave or freedman who took notes (*notæ*) of judicial proceedings in shorthand or cipher. The notary of modern law corresponds rather to the *tabellio* or *tabularius* of Roman law than to the *notarius*. In the canon law the notary was a person of great importance, and it was a maxim of that law that his evidence was worth that of two unskilled witnesses. In most European countries he still holds something of his old position under the canon law. In France, for instance, a document attested by a notary is said to be "legalized," a term much too strong to express the effect of such attestation in England, where the notary public, in spite of his name, is not recognized as a public officer to such a degree as the notary in other countries.

In America the duties of a notary vary in different States. They are generally as follows:—To protest bills of exchange and draw up acts of honor; to authenticate and certify copies of documents; to receive the affidavits of mariners and draw up protests relating to the same; to attest deeds and other instruments; and to administer oaths.

NOTICE. The primary meaning of notice is knowledge (*notitia*), as in "judicial notice;" thence it comes to signify the means of bringing to knowledge, as in "notice to quit;" at last it may be used even for the actual writing by which notice is given. The most important legal uses of the word are judicial notice and the equitable doctrine of notice. Judicial notice is the recognition by courts of justice of certain facts or events without proof. Other common uses of the word are notice to quit, notice of dishonor, notice of action (generally necessary in case of a breach of duty created by statute), notice of trial, notice in lieu of service of a writ (where the defendant is a foreigner out of the jurisdiction), notice to produce, etc. Notice may be either express or constructive. The latter is where knowledge of a fact is presumed from the circumstances of the case, e.g., notice to a solicitor is usually constructive notice to the client. Notice may be either oral or written. It is usually advisable to give written notice even where oral evidence is sufficient in law, as in the case of notice to quit. The American use of notice is practically the same as in England.

NOTKER, a name of somewhat frequent occurrence

in the ecclesiastical history of the Middle Ages. Among those by whom it was borne there are specially distinguished. NOTKER BALBULUS (c. 840-912) was a native of northern Switzerland, and, having become a monk of the monastery of St. Gall, held the position of "magister" in its school for many years. He was canonized in 1513. NOTKER LABEO, also a monk of St. Gall, died on June 29, 1022. His translations of the Old Testament Psalms, the *De Consolatione* of Boetius, the *Categories* of Aristotle, and some other works into Old High German are of considerable philological interest.

NOTO, a city of Italy, in the province of Syracuse (Sicily), twenty-four miles southwest of Syracuse. Built on a new site after the earthquake of 1693, it is laid out in modern style, and contains a number of handsome mansions belonging to the provincial aristocracy. The population of the city was 15,925 in 1881; that of the commune, 16,590 in 1871, reached 18,239 in 1901.

NOTTINGHAM, or NOTTS, an inland county of England, is bounded north by Yorkshire and Lincolnshire, west by Derbyshire, south by Leicestershire, and east by Lincolnshire. It is of an irregular oval shape, its length from north to south being fifty miles, and its greatest breadth from east to west about twenty-five miles. The area is 527,752 acres, or nearly 826 square miles.

The surface, though for the most part low, generally presents a pleasant diversity of hill and dale. The northern part is included in the great plain of York, and in the extreme north there is some extent of marshes. The valley of the lower Trent and that of the Idle are also very flat. In the southwest, between Nottingham and Warsop, the undulations swell into considerable elevations, reaching near Mansfield a height of 600 feet. The district includes Sherwood Forest, of which, in 1609, there were 44,839 acres inclosed, 9,486 woods, and 35,080 waste. The county generally is finely wooded, although to the east of the valley of the Soar there is a considerable stretch of wolds. The principal rivers are the Trent, the Erewash, the Soar, and the Idle. The oldest rocks of the county are the Coal-measures, which, forming part of the Yorkshire, Nottingham and Derby coalfield, stretch in from Derby, occupying principally the district west of a line drawn from Nottingham to Kirkby, although coal is obtainable below the other rocks as far east as Lincolnshire, at a depth of probably less than 4,000 feet. The principal workable seams are the Top Hard, the Deep Soft, the Deep Hard, and the Kilbourne coal. In 1881 there were thirty-nine collieries, producing together 4,758,060 tons.

As the higher regions of Derby and Yorkshire attract the rain-clouds, the climate of Nottingham is much above the average in dryness, and on that account crops ripen nearly as early as in the southern counties. The soil of about one-half the county is gravel and sand, including Sherwood Forest, where it inclines to sterility, and the valley of the Trent, where there is a rich vegetable mold on a stratum of sand or gravel. The land along the banks of the Trent is equally suitable for crops and pasture. The farms generally are of moderate size, the great majority being under 200 acres. Considerable improvements have taken place in the farm buildings and cottages, most of them being now built of brick and tile. According to the agricultural returns for 1883, there were 454,217 acres, or nearly nine-tenths of the total area under crops.

Nottinghamshire has for more than a century been the center of the hosiery trade of England, and it is now equally famous for its lace manufactures. Besides the numerous silk-mills and worsted-mills, there are also cotton-mills, bleachworks, sailcloth-works, paper-works,

iron and brass foundries, engineering shops, chemical works, maltworks, tanneries, and breweries.

The population, which in 1801 was 140,350, had increased in 1821 to 186,873, in 1851 to 270,427, in 1871 to 319,758, and in 1901 to 274,684, of whom 135,778 were males and 138,906 females.

NOTTINGHAM, a municipal and parliamentary borough of England, a county in itself and the chief town of Nottinghamshire, is finely situated on an acclivity of rock rising above the Trent and on several railway lines, 128 miles north-northwest of London and 15½ east of Derby. It is connected both with the Midland and Great Northern railway systems, while by means of the Trent, the Grantham Canal, and the Nottingham, Cromford, and Erewash Canal it has convenient water-communication with the counties of Lincoln, Leicester, Stafford, and Derby. Though the older streets are narrow and irregular, the rapid increase of the town has almost completely altered its character in this respect, most of the new streets being spacious, and some of them containing fine ranges of buildings. A new bridge across the Trent was opened in 1871. Nottingham possesses one of the largest market-places in England, its total area being about five and one-half acres. There are three old parish churches—St. Mary's Church, a fine cruciform structure, lately restored, now entirely in the Perpendicular style, and possessing a fine tower rising from the center in two stages, crowned with battlements and pinnacles; St. Peter's, which was nearly all rebuilt in the Perpendicular style in the fifteenth century, and has been enlarged at different times; St. Nicholas, a plain building in red brick with stone facings, erected in 1676. There are numerous fine modern churches, but special mention may be made of the Roman Catholic cathedral of St. Barnabas, in the Early English style, by Pugin, erected in 1842-44. Among the secular buildings are the exchange hall, which is now used as the town-council chamber; the town or guild hall (rebuilt 1741), a plain stuccoed building; the municipal offices (formerly the postoffice, 1848), in the classic style, with a Doric portico; the corn exchange; the county hall; the new postoffice, erected in 1868 in the Italian style; the people's hall (1754); the Albert Hall, for concerts (1876), a Gothic building with a tower; and the masonic hall (1880). The town also possesses a free museum of natural history, a mechanics' institute, and a free public library with nearly 40,000 volumes. Among the educational establishments the principal are University College, for which a splendid range of buildings was opened in 1881; the free grammar school, founded in 1513; the Nottingham High School for girls; the bluecoat school, founded in 1723; the people's college, founded in 1846 for children of the working classes; the Congregational institute for the education of students; and the Nottingham school of art, for which a fine building was erected in 1865 in the Italian style, and which is attended by over 500 students. There are a large number of benevolent institutions.

Nottingham has been a manufacturing town for more than 600 years, and toward the close of the last century became an important seat of the stocking trade. It was here that Richard Arkwright, in 1769, erected his first spinning frame, and here also Hargreaves had the year previously removed with his spinning jenny after his machine had been destroyed by a mob at Blackburn.

The population increased from 31,638 in 1801 to 79,564 in 1851, to 86,621 in 1871, and to 239,753 in 1901, of whom 119,000 were males and 120,753 females.

NOTTINGHAM, EARLS OF. HENEGAVE FINCH, first earl, lord chancellor of England, was descended

from an old family. In the register of Oxford university he is entered as born in Kent, December 23, 1621, and probably his native place was Eastwell, in that county. He was educated at Westminster and at Christ Church, Oxford, where he remained till he became a member of the Inner Temple in 1638. He was called to the bar in 1645, and soon obtained a lucrative practice. He was chosen a member of the convention parliament of April, 1660, and shortly afterward was appointed solicitor-general, being created a baronet the day after he was knighted. In May of the following year he was chosen to represent the university of Oxford, and in 1665 the university created him a D.C.L. In 1670 he became attorney-general, and in 1675 lord chancellor. He died December 18, 1682.

DANIEL FINCH, born in 1647, second earl, son of the preceding, entered parliament for Lichfield in 1679. He was one of the privy councilors who, in 1685, signed the order for the proclamation of the duke of York, but during the whole of the reign of James II. he kept away from the court. At the last moment he hesitated to join in the invitation to William of Orange, and after the abdication of James II. he was the leader of the party who were in favor of a regency. He declined the office of lord chancellor under William and Mary, but accepted that of secretary of state, retaining it till December, 1693. Under Anne he, in 1702, again accepted the same office in the ministry of Godolphin, but finally retired in 1704. On the accession of George I. he was made president of the council, but in 1716, he finally withdrew from office. He succeeded to the earldom of Winchelsea September 9, 1729, and died January 1, 1730.

NOVALIS. See HARDENBERG.

NOVARA, a city of Italy, the chief town of a province, stands between the Agogna and the Terdoppio, on a hill 545 feet above sea-level, in the plain between the Sessia and the Po. It is an important railway junction, thirty miles west of Milan, on the main line from Turin to Venice, which there connects with the continuation of the St. Gothard line and the Simplon route, as well as with a line to Alessandria and Genoa. Previous to 1830 Novara was still surrounded by its old Spanish ramparts, which were entered by only four gates, and gave the place a heavy appearance from the outside; it is now an open, modern-looking town. Besides being the largest grain market in the northwest of Italy, Novara trades in silk, linen, etc., and manufactures cotton, waxcloth, pottery, and starch. The provincial population was, by the census of 1901, 745,357; that of the city was 40,232 (or, with its suburbs, S. Martino, S. Andrea, S. Agabio, Bicocca, and Torrión, 44,928) in 1901.

NOVA SCOTIA, originally Acadia, a province of the Dominion of Canada, is composed of the peninsula proper and the adjoining island of CAPE BRETON (*q.v.*), which is separated from the mainland by the Gut of Canso. It is bounded on the north by Northumberland Strait (which divides it from Prince Edward Island) and the Gulf of St. Lawrence, northeast, southeast, and south by the Atlantic Ocean, and west by the Bay of Fundy and New Brunswick, being connected with the latter province by a narrow isthmus thirteen and a half miles wide. The extreme length from southwest to northeast is 350 miles, the breadth 120 miles, and the area 20,600 square miles (13,382,003 acres).

The province is intersected by chains of lofty hills, in most instances running parallel with the coast-line. The Cobequid Mountains, stretching in a long line from east to west and terminating in Cape Chignecto, form the chief ridge. Several of the elevations are as high as 1,100 feet, and are cultivable almost to their summits.

Lying on each side of this range are two extensive tracts of arable land which yield profitable crops. A sharply-outlined ridge of precipices runs for 130 miles along the Bay of Fundy from Briar Island at the farthest extremity of Digby Neck to Capes Split and Blomidon. Here and there masses of trap rocks, averaging from 200 to 600 feet in height and crowded with stunted firs, overhang the coasts. Beyond them lies the garden of Nova Scotia, the valley of the Annapolis, full of varied scenery, and unrivaled for its fruit, flowers, and cereals. The general slope of the country is southeasterly, in which direction there are several chains of lakes, the source of many rivers and streams of moderate length. The southeastern coast is remarkable for its harbors, twelve of which are capable of affording shelter to ships of the line, while between Canso and Halifax, a distance of 110 miles, there are fourteen ports which possess ample accommodation for merchantmen of average size. The principal inlets are Bay Verte, Tatamagouche, and St. George's Bay, in Northumberland Strait; Chedabucto Bay, at the head of the Gut of Canso; Halifax Harbor, Margaret's and Mahone Bays, on the southeast coast; St. Mary's Bay, on the southwest; Annapolis Basin, Minas Basin and Channel, and Cobequid Bay, on the west. Of these the most remarkable is Minas Basin, the eastern arm of the Bay of Fundy; it penetrates some sixty miles inland, and terminates in Cobequid Bay, where the tides rush in with savage impetuosity, rising sometimes as high as sixty feet, while on the opposite coast in Halifax Harbor, the spring tides scarcely exceed seven or eight feet. All along the coast of Nova Scotia there are many small islands, the southeast shore being literally studded with them. The chief are Caribou and Pictou, in Northumberland Strait; St. Paul, Scatari, and Isle Madame, off the coast of Cape Breton. Sable, a dangerous and sandy island, almost barren, lies 150 miles east of Halifax, and has long been noted as the scene of fearful shipwrecks. Its length is twenty-five miles by about one and one-half in breadth, the eastern end being in $43^{\circ} 59'$ N. latitude and $59^{\circ} 45'$ W. longitude. Other islands are Cape Sable, Seal, and Mud, in the south, and Long Island, at the entrance of St. Mary's Bay. The principal capes (apart from those of Cape Breton) are Malagash, John, and St. George, on the northern coast; Porcupine, Canso, Sambro Head, Penant Point, Crown Point, and La Have, on the southeast; Sable, on the south; St. Mary, Split, Chignecto, and Blomidon, on the west. The interior of the country is traversed and watered by many rivers and lakes, which cover an estimated area of 3,000 square miles. The rivers are, with few exceptions, navigable for coasting vessels for distances averaging from two to twenty miles. The principal are the Annapolis, Abon, Shubenacadie, East, Middle, and West, St. Mary's, Musquodoboit, La Have, Mersey. The largest lake is Lake Rossignol, situated in Queen's county, and more than twenty miles long. Ship Harbor Lake, fifteen miles in length, and Grand Lake are in Halifax county, College Lake is in the eastern part of the peninsula. The Bras d'Or Lake (Cape Breton) may be best described as an imprisoned sea. It is fifty miles long and of great depth, bordered by the counties of Victoria, Inverness, Richmond, and Cape Breton. The Carboniferous plain of New Brunswick is connected with that of Nova Scotia at its eastern extremity. The coalfields of the latter are especially valuable and productive. They are situated in Cape Breton, Cumberland, Pictou, Inverness and Richmond counties. In the year 1901 the value of the sales of Nova Scotia bituminous coal was \$3,493,655, consumed principally in Quebec, New Brunswick, Newfoundland. Prince

Edward Island, and the United States. About 4,235 persons are employed in this industry. The coal is bituminous and very rich in quality. In the Carboniferous areas there are immense deposits of pyroschist or bituminous shale, "capable," says Dawson, "of yielding as much as sixty-three gallons of oil, or 7,500 feet of illuminating gas, per ton. Owing to the great cheapness of petroleum little attention has been paid to these shales for some years, but it is likely that they will before long again be in demand."

Gold is found in workable quantities, the production in 1900 amounting to \$607,152. The gold district includes Caribou, Gay's River, Montagu, Oldham, Renfrew, Sherbrooke, Stormont, Tangier, Uniacke, Waverley, Wine Harbor, and unproclaimed—thirty mines in all. Iron ore abounds also in profitable quantities, and of excellent quality; the production in 1900 was 18,940 tons. Other minerals, such as manganese ore, barytes, etc., abound. A fair business is annually done in coke, fireclay, building-stone, and grindstones. Some veins of copper, silver, lead, and galena, especially rich in quality, exist. There are many curious and beautiful fossils, besides amethysts, agates, chalcedonies, jaspers, cairngorms, etc.

The climate of Nova Scotia somewhat resembles that of New Brunswick. There are extremes of heat and cold, and sudden changes of temperature, varying sometimes in one day as much as 50° . Considering its northern latitude, it is remarkably temperate on the whole. The extreme of cold is about 20° below zero in the depth of winter, and the greatest heat is 98° .

Nova Scotia is a valuable agricultural country; wheat, oats, rye, barley, buckwheat, Indian corn, potatoes, turnips, beets, tomatoes, etc., grow in abundance, while apples, pears, plums, cherries, strawberries, raspberries, cranberries, gooseberries, currants, and other fruits ripen to perfection. The orchards of Annapolis and King's counties extend along the roadsides for upward of fifty miles. The soil is of various degrees of fertility. The intervalle lands, which form an extensive part of the country, are rich, and yield largely. The uplands, lying between the hilly sections and the rivers, are of moderate capacity. The high lands are as productive as the intervalles.

The forests of Nova Scotia are extensive and valuable, the principal trees found in New Brunswick also growing in the sister province. They are chiefly pine, oak, tamarack, birch, maple, hemlock, spruce, butternut, ash, etc. The yield of timber is very great, the shipments in 1881 amounting in value to \$1,587,941.

Nova Scotia is not strong as a manufacturing country, but every year some new industries are added to the list. Coarse "homespun," coarse flannels, bed-linen, blankets, carpets, and tweeds are made in considerable quantities. Tanning is extensively carried on, and there are several factories where household and other furniture, agricultural implements, boots and shoes, saddlery, harness, tobacco, printing and wrapping paper, machinery, nails, pails and woodenware, fuse, gunpowder, carriages, and sleighs, etc., are made.

Next to Newfoundland, Nova Scotia possesses the largest and most valuable fisheries in British North America. Along the entire coast, extending over 1,000 miles, food fish of almost every description (salmon, trout, cod, halibut, haddock, bass, mackerel, herring, shad, lobsters, etc.), may be taken. Immense quantities of these are shipped to the West Indies, the United States, various ports in Canada; and of late years several varieties have been welcomed in British markets. The value of the fisheries for 1900 was \$7,809,152.

Most of the principal birds of North America are to be found in Nova Scotia, and the game of the country includes moose, caribou, duck, teal, geese, woodcock,

partridge, snipe, plover, etc. The game laws are very strict, and are rigidly enforced. The wild animals remaining in the province are bears, wolves, foxes, wild cats, and a few others.

Nova Scotia is well furnished with railways, there being, in 1901, 943 miles in operation. The roads of Nova Scotia are good and well maintained. Telegraphic lines are established nearly all over the province, and connect with the United States system.

The executive authority is in the hands of a lieutenant-governor and a council of eight members, four with portfolios and four without. Thirty-eight representatives are elected every four years to the house of assembly, and twenty legislative councilors are appointed for life by the local government. The lieutenant-governor is appointed by the governor-general of Canada in council. The system of administration is known as responsible government. The province returns twenty-one members to the Dominion House of Commons, and ten senators are appointed by the crown in the senate of Canada. They hold their positions for life. The province has the right to make its own civil laws, but in all criminal cases the form which obtains in all the courts is the criminal law of the Dominion. The judiciary consists of a chief justice, an equity judge, and five puisne judges, a supreme court having law and equity jurisdiction throughout the province, a vice-admiralty court, and a court of marriage and divorce. In each county there is a court of probate. There are also seven county-court judges.

Nova Scotia forms the ninth military district in the militia of Canada. The established strength of the active force by arms is composed of one troop of cavalry, one field battery of artillery, seventeen batteries of garrison artillery, nine battalions of infantry and rifles; total, 318 officers, and 3,638 non-commissioned officers and men. The period of service in time of peace is three years. British regiments of the line are also stationed at Halifax.

The public revenue of the province is a little more than one million dollars annually, and the expenditure is about the same.

There are two Roman Catholic dioceses in Nova Scotia—the archdiocese of Halifax and the diocese of Antigonish; the clergy of the two combined number seventy-six. A Church of England see was established at Halifax in 1787; the bishop, who has jurisdiction in Prince Edward Island also, has under him an archdeacon and eighty-five clergymen. The synod of the maritime provinces in connection with the Presbyterian Church in Canada includes 101 ministers in Nova Scotia. The Methodist Church has 100 clergymen and supernumeraries, and the Baptist denomination has 104. The free-school system is in operation, the whole community paying for its maintenance. The public charitable institutions receiving aid from the province are the insane asylum, poor's asylum and provincial city hospital, blind asylum, transient poor and visiting dispensary, and the deaf and dumb asylum, which is also helped by the New Brunswick Government. Several other institutions are maintained by societies and the benevolence of private individuals. The total pop. (1901) was 459,574, including 230,538 males and 229,036 females. In 1891 the population was 459,396. There are 2,125 Indians in Nova Scotia, principally Malicetes and Micmacs. The inhabitants consist chiefly of Scotch, English, Irish, American, German, Acadian French, Dutch, freed negroes, of whom there are 7,062, and various other nationalities.

Besides Halifax, the capital, of which the population is 40,832, the chief towns are Pictou (3,235), New Glasgow (4,447), Sidney (Sydney), C. B. (4,909), North

Sydney (4,616), Yarmouth (6,430), Liverpool (1,937), and Lunenburg (2,916). Windsor (3,398), possessing one of the principal colleges in the province, is also the center of a large trade in gypsum. Annapolis, formerly Port Royal, Truro, Amherst, Antigonish, and Pugwash are also rising and thriving towns.

Nova Scotia was first visited by the Cabots in 1497, but it was 1604 before any attempt at colonization by Europeans was made. This was the expedition headed by De Monts, a Frenchman, which tried to form settlements at Port Royal, St. Croix, and elsewhere, and endured severe hardships until 1614, when the English colonists of Virginia made a descent upon them, claimed the territory in right of the discovery by the Cabots, and expelled them from the soil. In 1621 Sir William Alexander obtained a grant of the whole peninsula, and it was named in the patent Nova Scotia instead of Acadia, the old name given the colony by the French. Alexander intended to colonize the country on an extensive scale, but the attempt was frustrated (1623) by the French. During the reign of Charles I. the Nova Scotia baronets were created, and their patents ratified in parliament. Their number was not to exceed 150, and in exchange for their titles and grants of land they agreed to contribute aid to the settlement. Cromwell dispatched a strong force to the possession in 1654. In 1667 it was ceded by the treaty of Breda to the crown of France. But the restless English colonists, unmindful of treaty obligations, attacked the French from time to time at various points, until, in 1713, the latter relinquished all claim to the country. England neglected it till 1749, when, the designs of the French again becoming marked, the Government made strenuous exertions to induce British settlers to go there. More than 4,000 emigrants, with their families, sailed for the colony; and Halifax was founded. But the French settlers, who enjoyed privileges as neutrals, still embraced a considerable portion of the population, and, with their allies the Indians, proved exceedingly troublesome to the English. They were finally expelled; and, in 1758, a constitution was granted to Nova Scotia. By the treaty of Paris, in 1763, France resigned all pretension to the country. In 1784 New Brunswick and Cape Breton were separated from Nova Scotia; but, in 1819, the two latter divisions were reunited, and in 1867 they became part of the Dominion of Canada.

NOVATIANUS, Roman presbyter, and one of the earliest antipopes, founder of the sect of the Novatiani or Novatians, was born about the beginning of the third century. On the authority of Philostorgius, he has often been called a native of Phrygia, but perhaps the historian intended by this nothing more than to indicate the Montanistic complexion of Novatian's creed. Of the facts of his life very little is known, and that only from his opponents.

NOVATION is a term derived from the Roman law, in which *novatio* was of three kinds—substitution of a new debtor (*expromissio* or *delegatio*), of a new creditor (*cessio nominum vel actionum*), or of a new contract. In American law, as in English, the term is something of a novelty, except in Louisiana, the only State where the civil law prevails.

NOVA ZEMBLA, or, more correctly, NOVAYA ZEMLYA (*i.e.* "New Land"), is a large island surrounded by many small ones, situated in the ARCTIC OCEAN, and belonging to the Russian empire. It has the shape of an elongated crescent, 600 miles in length, with an average width of 60 miles, and an estimated area of 40,000 square miles, separating the Kara Sea on the east from that part of the Arctic Ocean which is often called Barents' Sea. The northeastern extremity of Novaya Zemlya lies a little to the west of the meridian

of the peninsula of Valmal, from the extremity of which it's only 160 miles distant. Its southern part, bending toward the southeast, appears as a continuation of the Vagatch (Vaygach) Island, from which it is separated by the Kara Strait, thirty miles in width—the island itself being separated from the continent by the narrow Ugrian Strait, only seven miles broad. Novaya Zemlya is cut through about the middle by a narrow winding channel, the Matotchkin (Matochkin) Shar, which also connects the Arctic Ocean with the Kara Sea.

While the eastern coast runs as a regular curve, with deeper indentations only in its middle, the western is deeply indented by numerous and in some cases fjord-like bays, studded, like the rest of the coast, with many islands.

The interior of Novaya Zemlya is almost unknown; still, the broad features of its structure can be inferred from data obtained at various points on the coast.

Though milder than that of northeastern Siberia, the climate of Novaya Zemlya is colder even than that of Spitzbergen. Grass does not grow to any extent except in Goose Land, where the soil is covered with finer débris. Elsewhere even the leaved lichens are precarious, though the leather lichens flourish, especially the *Vermicaria geographia*.

The desolate interior shows hardly a trace of animal life, save perchance a solitary vagrant bird, a few lemmings, an ice-fox, a brown or white bear, and at times immigrant reindeer. Even insects are few; the very mosquitoes of the tundras are wanting, and only a solitary bee flies among the scanty flowers. The seacoast, however, is occupied by countless numbers of birds, which come from the south for the breeding season, and at certain parts of the seacoast the rocks are covered with millions of *Uria troile*, and the air is resonant with their cries, while numberless flocks of ducks, geese, and swans swarm every summer on the valleys and lakes of the southern part of the island. Whales, walruses, seals, and dolphins are still abundant. Only two species of fish are of any importance—the *goltzy* (*Salmo alpinus*) in the western rivers, and the *omul* (*Salmo omul*) in the eastern.

The numbers of sea mammals in the sea around Novaya Zemlya and the vast quantities of birds attracted Russian hunters as soon as they became acquainted with the northern Ural, and even in the sixteenth century they had extended their huts to the extreme north of the island. Many of them wintered for several consecutive years on Novaya Zemlya without suffering great losses from scurvy; but no inhabitants have ever tried to establish themselves permanently on the island. The hunters were very often extremely successful; but the industry has always been subject to great vicissitudes. During the last twenty-five years the Archangel and Kola hunters have but rarely visited Novaya Zemlya; on the other hand, both it and the Kara Sea are now more and more visited by Norwegians. A few Samoyede families, recently settled by the Russian Government at Karmakuly, have remained there for several consecutive years, living chiefly by hunting the reindeer which abound on the eastern coast, and of which two varieties are distinguished, one like that of Spitzbergen.

Novaya Zemlya seems to have been known to Novgorod hunters in the eleventh century; but its geographical discovery was four centuries later, at the time of the great movement for the discovery of the northeastern passage.

NOVEL. See ROMANCE.

NOVELLO, VINCENT, an artist whose efforts to diffuse an increased taste for classical music in England fifty years ago have been crowned with permanent suc-

cess, was born in London September 6, 1781. He was organist at different times of the Sardinian, Spanish, and Portuguese chapels, and of St. Mary's chapel, Moorfields. He was an original member of the Philharmonic Society, of the Classical Harmonists, and of the Choral Harmonists. He composed an immense quantity of sacred music, much of which is still popular. Novello died at Nice on August 9, 1861.

NOVEMBER (or *Novembris*, sc. *mensis*, from *novem*), the ninth month of the old Roman year, which began with March. By the Julian arrangement, according to which the year began with January 1st, November, while retaining its old name, became the eleventh month and had thirty days assigned to it. The 11th of November was held to mark the beginning of winter (*hiemis initium*); the sacred banquet called "epulum Jovis" took place on the 13th. In the calendar of the first French republic November reappeared partly as Brumaire and partly as Frimaire.

NOVERRE, JEAN GEORGES, an artist to whom the action and music of the modern ballet may almost be said to owe their existence, was born in Paris April 29, 1727. He first performed at Fontainebleau in 1743, and in 1747 composed his first ballet for the Opéra Comique. In 1755 he was invited by Garrick to London, where he remained two years. In 1775 he was appointed *Maitre des Ballets* at the Académie; this post he retained until the Revolution reduced him to poverty, which he endured until his death, at St. Germain, in 1810.

NOVGOROD, a government of northwestern Russia, bounded on the west and north by St. Petersburg and Olonetz, on the southeast by Vologda, Yaroslavl, and Tver, and on the southwest by Pskov, has an extreme length from southwest to northeast of 400 miles, and an area of 47,240 square miles. Its southern part is occupied by the Valdai or Alaun plateau, which has the highest elevation of middle Russia (800 to 1,000 feet), and contains the sources of all the great rivers of the country. It is deeply furrowed by valleys with abrupt slopes, which give it the aspect of a highland region, and descends rapidly toward the valley of Lake Ilmen in the west, which is only 107 feet above the sea-level. The northeastern part of the government belongs to the lake district of northwestern Russia. The chief river is the Volkhoff, which flows from Lake Ilmen into Lake Ladoga. Other navigable rivers are the Syas, also flowing into Lake Ladoga, and the Sheksna and the Mologa, tributaries of the Volga. A brisk traffic is steadily carried by the Novgorod rivers, as all boats from the Volga to St. Petersburg pass through this government, while the goods embarked within the province itself amount to more than 7,000,000 hundredweights, worth from 6,000,000 to 7,000,000 rubles.

The climate is very harsh, the yearly average temperature at Novgorod being only 38.8° Fahr. Neither gardening nor the raising of cattle is very flourishing; in 1877 there were only 212,000 horses, 364,000 cattle, and 253,000 sheep. A number of petty trades are successfully carried on in the villages, all kinds of wooden wares being made and exported; the preparation of timber, pitch, tar, and charcoal is general, and shipbuilding is widely diffused in several districts. The fisheries on the great lakes are valued at 170,000 rubles annually, and, owing to the proximity of the capital, hunting is still profitable. But the greater number of the inhabitants are dependent on the river-boat traffic; and nearly one-fourth of the able-bodied male population are driven in search of work to other parts of Russia. The Novgorod carpenters and masons still maintain their old-established renown. The industrial

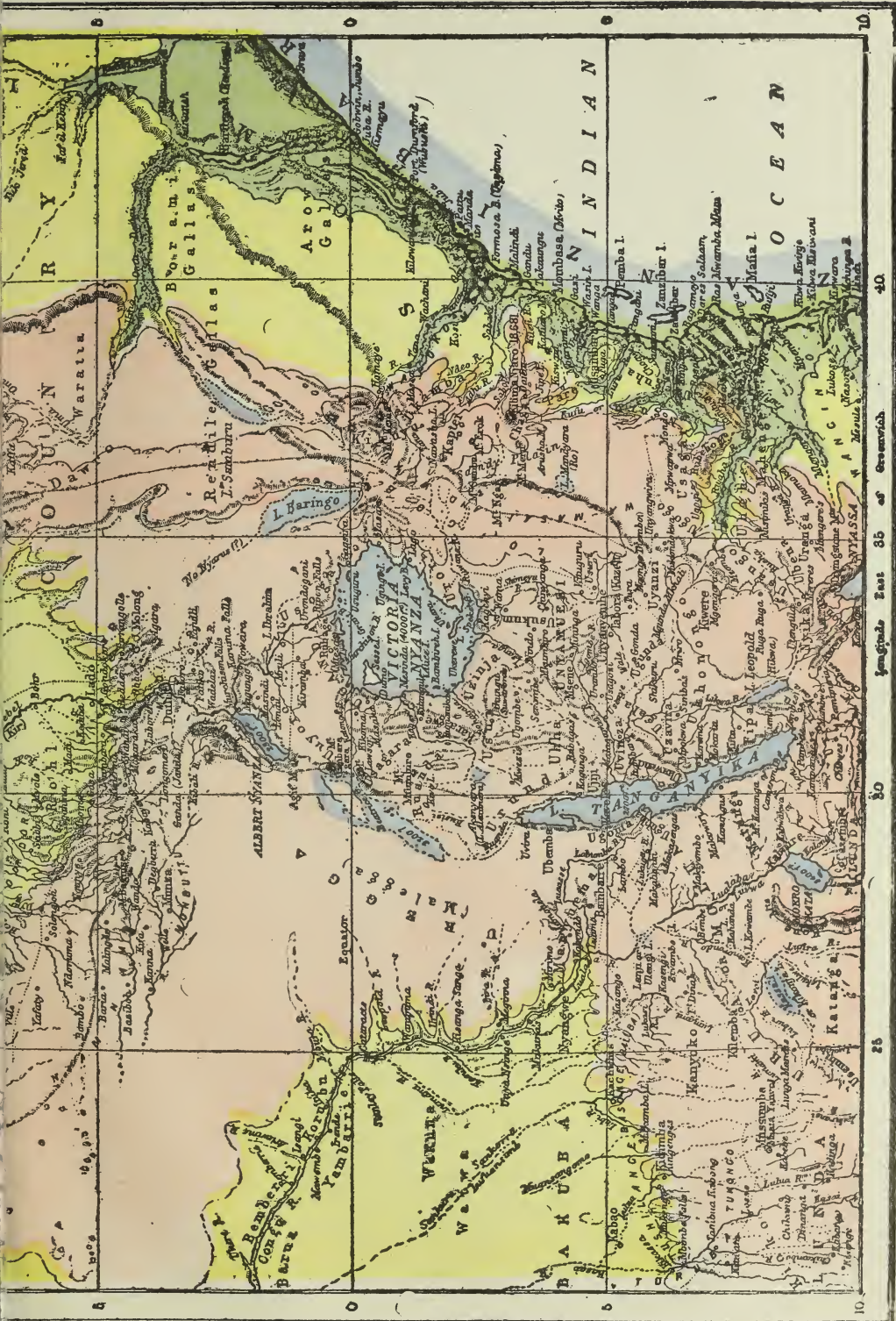
NILE

NOTE
For the lower course of the Nile see Plate VI & VII.

Scale of English Miles
0 100 200 300

Deep Green shows altitudes up to 500 feet
Pale Green " " 1000 " "
Yellow " " 2000 " "
Pale Pink " " 5000 " "
Dark Pink " " above 5000 " "
Limits of the Nile Basin





establishments are few. Trade, which is animated in several towns and at several points of the river-system, is chiefly in grain and timber, and in manufactures and grocery wares from St. Petersburg. The fairs are numerous, and several of them show considerable returns. The inhabitants are almost exclusively Great Russians. They belong mostly to the Greek Church, but there are many Nonconformists. Lutherans and Catholics number respectively 4,000 and 2,000. Novgorod, apart from the usual schools and gymnasiums, is better provided with educational institutions than many other governments of Russia, and, through the successful efforts of its *zemstvo*, primary education is more widely diffused in the villages. The government is but thinly inhabited, the population (1,011,500 in 1870) being only 1,392,933 in 1898. The chief towns of the eleven districts are: Novgorod (26,095 inhabitants), Borovich, Byelozersk (6,000), Tcherepovets (3,600), Demiansk (1,500), Kirilloff (3,200), Krestsy (3,200), Staraya Russa (6,000), Ustyuzhna (7,000), and Valдай (3,800).

NOVGOROD, capital of the above government, is situated 119 miles to the south of St. Petersburg, on the low flat banks of the Volkhoff, some two miles below the point where it leaves Lake Ilmen. The present town is but a poor survival of the wealthy city of mediæval times. It consists of a kremlin (old fortress) and of the city, which stands on both banks of the river, here connected by a handsome bridge.

NOVI, or (to distinguish it from Novi di Modena, etc.) NOVI LIGURE, a city of Italy, in the province of Alessandria (Piedmont), at the foot of the Apennines and on the edge of a fertile plain, about twenty miles south of the river Po. It is of importance mainly as the meeting-place of the railways from Alessandria, Genoa, and Piacenza, and is one of the leading seats of the silk industry in Italy. The population of the city was 10,100 in 1900; that of the commune 11,445 in 1861, and 14,500 in 1900. In August, 1799, was fought the great battle of Novi, in which the French under Jourbert were defeated by the Russians under Suwaroff, and in November of the same year there was a lesser conflict, in which the French proved victorious over the Austrians.

NOVIBAZAR, NOVIPAZAR, or YENIPAZAR (*i.e.*, New Market), on the Rashka, a tributary of the Ibar and subtributary of the Danube, is the chief town of a sanjak in the Turkish vilayet of Bosnia (formerly of Kossovo), which was occupied by Austria-Hungary in 1879 in accordance with the terms of the treaty of Berlin. Owing to the configuration of the country it is a point of great strategical importance, commanding the lines of communication between Bosnia and Rumelia, and between Serbia and Montenegro. Population about 12,500.

NOVO-BAYAZET, or NOVUII BAYAZET, a town of trans-Caucasian Russia, at the head of a district (area 2,390 square miles, population 67,800) in the Erivan government, sixty miles east-northeast of Erivan, and about four east of Goktchi Lake, lies 5,870 feet above the sea, on the rocky ravine of the Kavar-tchai.

NOVOGEORGIEVSK, a town and a fortress of Russia. (1) The former, usually known under the name of Kriloff, in the government of Kherson, district of Alexandriya, stands at the junction of the Tyasmin with the Dnieper, nine miles to the northwest of the Kremenchug railway station. Its fort was erected by the Poles in 1615 to protect the passage across the Dnieper, and to guard the steppe on the left bank of the river. (2) NOVOGEORGIEVSK, or Modlin, is a first-class fortress of Russia in Poland, at the junction of the Nareff with the Vistula, nineteen miles to the northwest of Warsaw.

NOVOMOSKOVSK, a district town of Russia, in the government of Ekaterinoslaff, nineteen miles to the northeast of the capital of the province. The very fertile surrounding country was rapidly colonized, and now has several villages each of more than 5,000 and one above 10,000 inhabitants. The population of Novomoskovsk, which numbers 11,000, is chiefly engaged in agricultural pursuits.

NOVOTCHERKASSK, capital of the province of the Don Cossacks, is situated 737 miles south-southeast from Moscow, and 40 miles from the sea of Azof. The population of the town (1898) was 52,005.

NOWGONG, or ΝΑΟΓΑΟΝ, a district in the chief-commissionership of Assam, India. The district, which has an area of 3,417 square miles, consists of a wide plain much overgrown with jungle and canebrakes, intersected by numerous offshoots and tributaries of the Brahmaputra, and dotted with shallow marshes. It is estimated that about a hundred minor streams become navigable in the rainy season. The Mikir Hills cover an area of about sixty-five miles by thirty-five in the south of the district; the highest peak is about 3,500 feet. The slopes are very steep, and are covered with dense forest. Wild beasts of all kinds abound. The population in 1901 was 310,579, of whom about 12,000 were Mohammedans and the rest mainly aborigines or semi-Hinduized aborigines and Hindus in about equal proportions.

NOY, WILLIAM, attorney-general, was born in Buran, Cornwall, England, in 1577, his father belonging to a family whose pedigree is included in the visitation of Cornwall in 1620. He matriculated at Exeter College, Oxford, April 27, 1593. His legal career began at Lincoln's Inn, and throughout life he was a diligent student of the grounds and precedents on which English law is based. From 1603 until his death in 1634 he was elected, with one exception, to each parliament, sitting invariably for a constituency of his native county.

NOYON, a city of France, department of Oise, sixty-seven miles north-northeast of Paris by the railway to Brussels, is built at the foot and on the slopes of a hill, and traversed by a small stream, the Verse, which joins the Oise a mile farther down. The old cathedral of Notre Dame, constructed during the latter half of the twelfth century, is a fine example of the mixture of Romanesque and Gothic architecture. The population of the commune and that of the city were respectively 6,268 and 5,236 in 1872, and 6,252 and 5,780 in 1901.

NUBIA, a country of northeast Africa, bounded on the north by Egypt, on the south by Abyssinia, Senaar, and Kordofan, and on the east and west by the Red Sea and the Libyan Desert respectively. It thus comprises the whole of the Nile valley, from Assuan (Oswân, Syene) near the first cataract southward to Khartûm at the confluence of the White and Blue Niles, stretching in this direction for about 560 miles between 16° and 24° N. latitude, and for nearly the same distance east and west between 31° and 39° E. longitude. But Nubia has at no time formed a strictly political, ethnical, or even administrative expression. Unless it can be identified with the Nob or Nub—that is, "Gold"—region of the hieroglyphic records, the term was unknown to the ancients, by whom everything south of Egypt was vaguely called Ethiopia, the land of the dark races. It is first associated historically, not with any definite geographical region, but with the Nobate, a negro people removed by Diocletian from the western oasis to the Nile valley above Egypt (Dodecaschœnus), whence the turbulent Blemmyes had recently been driven eastward. From Nûba, the Arabic form of the name of this people, comes the modern Nubia, a term about

the precise meaning of which no two writers are of accord. Locally it is restricted to a comparatively small district, the Wády al-Núba, reaching from Sebú' along the Nile southward to the north frontier of Dongola. Officially it finds no recognition as an administrative division of the khedive's possessions, the region commonly understood by Nubia, as above roughly defined, being completely absorbed for administrative purposes, partly in the government of Upper Egypt, but mainly in that of Egyptian or Eastern Súdán (Soudan). Within these two governments it comprises the whole of the four mudíriehs (provinces) of Berber, Táká, Dongola (Donkola), and Suákin (more correctly Sawákin), besides parts of Massowah, Khartúm, and Esneh (Upper Egypt), with a total area of about 345,000 square miles, and a population vaguely estimated (1878, 1882) at from 1,000,000 to 1,500,000.

Wild animals are rare except in the Táká forests, where the elephant, lion, panther, rhinoceros, giraffe, hyena, and wild boar are met with. The crocodile and hippopotamus infest all the streams; many species of large and small snakes occur, but few are poisonous; the stork, wild goose, partridge, ibis, are among the chief representatives of the local avifauna.

The population being almost exclusively agricultural and pastoral, the industries are unimportant, and limited mainly to coarse cottons and woollens, pottery, and household utensils made of the date-tree. The exports also are confined to senna, some grain, leeches, musk, and honey. But although the local traffic is small there is a very large transit trade, carried on chiefly by caravans between Central Africa and Egypt. In this way considerable quantities of ivory, gold dust, ostrich feathers, and slaves have from the remotest times been brought down from the interior through Nubia to the seaports on the Mediterranean and the Red Sea. Of late years the slave trade has been almost entirely suppressed.

NUGEENAH. See NAGINA.

NUGENT, ROBERT, who ultimately became Earl Nugent, was a native of Westmeath in Ireland, and a Roman Catholic, tersely described by Richard Glover as "a jovial and voluptuous Irishman who had left Popery for the Protestant religion, money, and widows." His change of religion took place at a very early period in life. A speaker of great liveliness joined to good sense—Horace Walpole said that he seemed now and then on the precipice of absurdity, but that he kept clear of it—his support of the ministry was so useful that he became, in 1767, Viscount Clare, and, in 1776, Earl Nugent, both Irish peerages. He died October 13, 1788.

NUISANCE, in English law, is either public or private. A public or common nuisance is defined as an act not warranted by law, or an omission to discharge a legal duty, which act or omission obstructs or causes inconvenience or damage to the public in the exercise of rights common to all citizens. A common nuisance is punishable as a misdemeanor at common law, where no special provision is made by statute. In modern times many of the old common-law nuisances have been the subject of legislation. In some cases the common law and statutory remedy appear to be concurrent. It is no defense for a master or employer that a nuisance is caused by the acts of his servants, if such acts are within the scope of their employment, even though such acts are done without his knowledge and contrary to his orders. Nor is it a defense that the nuisance has been in existence for a great length of time, for no lapse of time will legitimate a public nuisance. Examples of public nuisances are the obstruction of highways, bridges, and navigable rivers, the keeping of disorderly

houses and gaming-houses, and the carrying on of offensive trades.

A private nuisance is an act or omission which causes inconvenience or damage to a private person, and is left to be redressed by action. It is not easy to define what amount of infringement of the rights of property will give a right of action. There must be some sensible diminution of these rights affecting the value or convenience of the property. The real question in all the cases is the question of fact, whether the annoyance is such as materially to interfere with the ordinary comfort of human existence. A private nuisance, differing in this respect from a public nuisance, may be legalized by uninterrupted use for twenty years. It used to be thought that, if a man knew there was a nuisance and went and lived near it, he could not recover, because, it was said, it is he that goes to the nuisance and not the nuisance to him. But such is not the law now. In such a case the newcomer has his civil remedy if the nuisance has not existed for twenty years, and of course his remedy at criminal law irrespective of time if the nuisance be public. The American law on the subject is practically the same as the English law.

NUKHA, a town of Russia, in the Caucasian government of Elizabetopol (formerly of Baku), and previous to 1819 the capital of the khanate of Sheki, lies 173 miles east-southeast of Tiflis, at the foot of the main chain of the Caucasus. Population, 1898, 24,811.

NULLIFICATION ACTS is a term used with reference to certain acts adopted by the Legislature of South Carolina in 1830-32, by which it was sought to nullify various acts of Congress in relation to the tariff. The claim was made in several of the States, and notably in South Carolina, that "it is an unconstitutional exercise of power on the part of Congress to lay duties to protect domestic manufactures." The cotton-producing States sold their chief product in European markets and were averse to any legislative action which looked toward the building up of New England cotton factories. The advocates of STATES' RIGHTS (*q.v.*) carried their doctrine to the extreme of claiming the right for individual States to nullify the Federal revenue laws, whenever in the opinion of the State Legislatures Congress had transcended its power. Under these circumstances the nullification movement assumed the form almost of a secession from the Union, and forecasted the events of 1860-61.

Andrew Jackson was president of the United States when the State of South Carolina undertook its nullification proceedings, and he made short work of them. After the South Carolina Legislature had several times declared, each time in stronger language, what it would or could or might do if a tariff bill were passed, Congress repealed the act of 1828, and adopted a new scale to take effect March 3, 1833. President Jackson had already declared in emphatic terms that he would see to the execution of the laws, and the State Legislature had declared his statement to be an unauthorized interference with the affairs of South Carolina. Finally on November 24, 1832, a convention called by the Legislature adopted an ordinance "to nullify certain acts of the Congress of the United States, purporting to be laws laying duties and imposts on the importation of foreign commodities." It declared the tariff laws of 1828 and 1832 to be unconstitutional and void and the collections of duties unlawful, and finally declared that if any attempt should be made by the Federal Government to coerce the State, they would hold themselves absolved from all obligations to maintain their political connection with the Union and would organize a separate government. This document was sent out to other States as the declaration of South Carolina.

Fortunately the United States possessed in the person of Andrew Jackson a man who was not afraid to administer the laws which he had sworn to execute. He replied to the "brave words" of the so-called convention with a proclamation declaring the ordinance an act of nullification and secession, denying the right of any State to annul a law, and declaring his determination "to execute the laws, to preserve the Union by all constitutional means, to arrest, if possible, by moderate and firm measures, the necessity of a resort to force."

The South Carolina legislature protested, exhorted the people to ignore the president's proclamation, and, on December 20, 1832, passed an act to carry the ordinance into effect by providing judicial remedies in the State courts for the recovery of goods seized or held for dues under the act of Congress. On March 2, 1833, Congress amended the act of 1832 by a compromise act reducing certain duties, and followed it on the next day by a Force Act, empowering the president to use military force to secure the collection of duties. Twelve days later the convention came together again and repealed its ordinance of nullification, but three days later it adopted another ordinance declaring the Force Act null and void. But, as the original ordinance had been repealed and the duties were collected without trouble, General Jackson could afford to treat the last ebullition as mere *brutum fulmen*, and did so, although he is credited with an expressed desire to hang John C. Calhoun, the leader of the nullification movement.

NUMANTIA, a town in Hispania Tarraconensis, of great natural strength, is famous for the memorable siege by the Romans under Scipio Africanus the younger. The siege began in 134 B.C.; the city was defended with the utmost bravery and tenacity, but after enduring the last extreme of famine the Spaniards were forced to surrender at discretion in 133. The inhabitants were sold as slaves and the town leveled to the ground.

NUMA POMPILIUS, the second of the legendary kings of Rome, was a Sabine, a native of Cures; his father's name was Pompo and his wife was daughter of Tattius, the Sabine colleague of Romulus. His election, which was made by the Roman people and ratified by the senate, took place at the close of a year's interregnum, during which the sovereignty had been exercised by the members of the senate in rotation. His peaceful reign of forty-three years was marked by the creation of many of the most characteristic institutions of Rome; it was he who set up the worship of the god Terminus, appointed the festival of Fides, built the temple of Janus, reorganized the calendar, fixed days of business and days of cessation therefrom, instituted the flamens of Mars and Quirinus, the virgins of Vesta, the salii, the feliales, the pontifices; in a word, the city which had been founded by means of violence and arms he succeeded in founding anew upon principles of justice, law, and morality. He derived his inspiration from Egeria or Ageria, his spouse, whom he used to meet unattended in the grove of the Camena, where a perennial spring gushed from a dark recess. He was above eighty when he died.

NUMBERS, BOOK OF. See PENTATEUCH.

NUMBERS, PARTITION OF. This subject, created by Euler, though relating essentially to positive integer numbers, is scarcely regarded as a part of the Theory of Numbers. We consider in it a number as made up by the addition of other numbers.

NUMBERS, THEORY OF. The Theory of Numbers, or higher arithmetic, otherwise arithmology, is a subject which, originating with Euclid, has in modern times, in the hands of Legendre, Gauss, Lejeune-Dirichlet, Kummer, Kronecker, and others, been developed

into a most extensive and interesting branch of mathematics. We distinguish between the ordinary (or say the simplex) theory and the various complex theories.

NUMENIUS, one of the so-called Neo-Pythagoreans, and a forerunner of the Neo-Platonists, was a native of Apamea in Syria, and flourished during the latter half of the second Christian century. He was a somewhat voluminous writer on philosophy and philosophical biography, but all that is known of his opinions is found in passing references by Clement of Alexandria, Origen, Eusebius, and one or two of the Neo-Platonists.

NUMERALS. The use of visible signs to represent numbers and aid reckoning is not only older than writing but older than the development of numerical language on the denary system; we count by tens because our ancestors counted on their fingers and named numbers accordingly. So used, the fingers are really numerals, that is, visible numerical signs; and in antiquity the practice of counting by these natural signs prevailed in all classes of society.

The fingers serve to express numbers, but to make a permanent note of numbers some kind of mark or tally is needed. Thus the Romans kept count of years by yearly driving a nail into the temple of Minerva. The nail in this case is a sort of hieroglyphic, and in all systems of hieroglyphics signs for numbers naturally occur. A single stroke is the obvious representation of unity; higher numbers are indicated by groups of strokes. But when the strokes become many they are confusing, and so a new sign must be introduced, perhaps for 5, at any rate for 10, 100, 1,000, and so forth. Intermediate numbers are expressed by the addition of symbols, as in the Roman system $ccxxvii=236$. Alphabetic writing did not do away with the use of numerical symbols, which were more perspicuous and compendious than words written at length. But the letters of the alphabet themselves came to be used as numerals. One way of doing this was to use the initial letter of the name of a number as its sign. This was the old Greek notation, said to go back to the time of Solon, and usually named after the grammarian Herodian, who described it about 200 A.D.

The most familiar case of the use of letters as numerals is the Roman system. Here C is the initial of centum and M of mille; but instead of these signs we find older forms, consisting of a circle divided vertically for 1,000 and horizontally, or in the cognate Etruscan system divided into quadrants for 100. From the sign for 1,000 comes D, the half of the symbol for half the number; and the older forms of L suggest that this also was once half of the hundred symbol. So V (Etruscan Λ) is half of X, which itself is not a true Roman letter. When high numbers had to be expressed systems such as we have described became very cumbersome, and in alphabetic systems it became inevitable to introduce a principle of periodicity, by which, for example, the signs for 1, 2, 3, etc., might be used with a difference to express the same number of thousands. The sexagesimal system, long specially associated with astronomy, has left a trace in our division of the hour and of the circle, but as language goes by powers of 10 it is practically very inconvenient for most purposes of reckoning. The Greek mathematicians used a sort of decimal system; thus Archimedes was able to solve his problem of stating a number greater than that of the grains of sand which would fill the sphere of the fixed stars by dividing numbers into octades, the unit of the second octade being 10^8 and of the third 10^{16} . So, too, Apollonius of Perga teaches multiplication by regarding 7 as the *pythmen* of 70, 700, and so forth. One must then find successively the product of the several pythmens of the multiplier and the multiplicand, noticing in

each case what are tens, what hundreds, and so on, and adding the results. The want of a sign for zero made it impossible mechanically to distinguish the tens, hundreds, etc., as we now do.

Very early, however, a mechanical contrivance, the abacus, had been introduced for keeping numbers of different denominations apart. This was a table with compartments or columns for counters, each column representing a different value to be given to a counter placed on it. This might be used either for concrete arithmetic—say with columns for pence, shillings, and pounds; or for abstract reckoning—say with the Babylonian sexagesimal system. An old Greek abacus found at Salamis has columns which, taken from right to left, give a counter the value of a 1, 10, 100, 1,000 drachms, and finally of 1 talent (6,000 drachms) respectively. An abacus on the decimal system might be ruled on paper or on a board strewn with fine sand, and was then a first step to the decimal system. Two important steps, however, were still lacking: the first was to use instead of counters distinctive marks (ciphers) for the digits from one to nine; the second and more important was to get a sign for zero, so that the columns might be dispensed with, and the denomination of each cipher seen at once by counting the number of digits following it. These two steps taken, we have at once the modern so-called Arabic numerals and the possibility of modern arithmetic; but the invention of the ciphers and zero came but slowly, and their history is a most obscure problem.

What is quite certain is that our present decimal system, in its complete form, with the zero which enables us to do without the ruled columns of the abacus, is of Indian origin. From the Indians it passed to the Arabians, probably along with the astronomical tables brought to Bagdad by an Indian ambassador in 773 A.D. At all events the system was explained in Arabic in the early part of the ninth century by the famous Abū Ja'far Mohammed al-Khārizmī, and from that time continued to spread, though at first slowly, through the Arabian world.

In Europe the complete system with the zero was derived from the Arabs in the twelfth century, and the arithmetic based on this system was known by the name of *algorithmus*, *algorithm*. This barbarous word is nothing more than a transcription of Al-Khārizmī, as was conjectured by Reinaud, and has become plain since the publication of a unique Cambridge MS. containing a Latin translation—perhaps by Adelhard of Bath—of the lost arithmetical treatise of the Arabian mathematician. The arithmetical methods of Khārizmī were simplified by later Eastern writers, and these simpler methods were introduced to Europe by Leonardo of Pisa in the West and Maximus Planudes in the East. The term zero appears to come from the Arabic *sifr* through the form *zephyro* used by Leonardo.

NUMERIANUS, M. AURELIUS, Roman emperor, accompanied his father, the emperor Carus, on the Persian expedition beyond the Tigris, and along with his absent brother, Carinus, was proclaimed emperor on the death of the former (December, 283). Having resolved to abandon the campaign, he was returning toward Europe when he mysteriously died before Chalcedon was reached, eight months afterward.

NUMIDIA was the name given to a large tract of country in the north of Africa, extending along the Mediterranean sea from the confines of Mauretania to those of the Roman province of Africa. The term was, however, employed in very different senses, and within very different limits, at different periods of time. When Carthage was at the height of its power, and the Romans first came into contact with the nations of north-

ern Africa, the name of Numidia was applied to the whole country from the river Mulucha (now called the Mulūya), about 100 miles west of Oran, to the frontier of the Carthaginian territory, which nearly coincided with the modern regency of Tunis. It is in this sense that the term is employed by Polybius, and all succeeding historians down to the close of the Roman republic. Numidia was not incorporated with the Roman empire until a later period.

The name of the Numidians appears to have been nothing more than a Latinized form of the Greek term *Nomades*, vaguely applied by them to the wandering tribes of northern Africa. It could never have had any ethnographical signification; and there can be no doubt that the people thus designated were merely a portion of the great Berber race, which extended in ancient times from the shores of the Atlantic to the confines of Egypt, and which still, under the name of Kabyles, forms a portion of the population of both Algeria and Tunis.

The chief towns of Numidia under the Romans were: Cirta, the capital, in the interior, subsequently called Constantina, which name it still retains; Rusicada, on the coast, serving as its port, on the site now occupied by Philippeville; and east of it the more important city of Hippo Regius (well known as the see of the celebrated Augustine), near the modern Bona. South of Cirta, in the interior, were Theveste (now Tebessa) and Lambæsa (now Lambessa), with extensive Roman remains. But there were not less than ten towns with the title of "colonizæ," and in the fifth century the *Notitia* enumerates no less than 123 episcopal sees.

NUMISMATICS. The science of numismatics treats of coins and medals. It acquaints us with the metals used in their compositions, their various inscriptions and devices, their mechanical execution and artistic merit. It tells us of the different denominations of coins, their relation to one another, and the laws by which they were regulated.

The earliest known coins were issued by the Greeks in the seventh century before the Christian era. By the fourth century the whole civilized world used money, each State generally having its proper coinage. This has continued to be the case to the present time; so that now there are few nations without a metal currency of their own, and of these but a small proportion are wholly unacquainted with the use of coins. The number of varieties of coins and medals of which specimens are preserved in collections may be estimated at not less than several hundred thousand; and future discoveries will probably greatly increase this sum. A series of monuments of such length and completeness affords, as might be expected, very important illustration to history and to kindred branches of knowledge. This is, indeed, the real value of numismatics, and the student will do well to keep it constantly before him.

Coins, although they confirm history, rarely correct it, and never very greatly. The earliest belong to a time and to nations as to which we are not otherwise wholly ignorant, and they do not afford us that precise information which would fill in any important details of the meager sketch of contemporary history. We gain from them scarcely any direct historical information, except that certain cities or princes issued money. When in later times the devices and inscriptions of the coins give more detailed information, history is far fuller and clearer, so that the numismatic evidence is rarely more than corroborative. There are, indeed, some remarkable exceptions to this rule, as in case of the Bactrian coins, which have supplied the outlines of a portion of history which was otherwise almost

wholly lost. The value of the corroborative evidence afforded by coins must not, however, be overlooked. It chiefly relates to chronology, although it also adds to our knowledge of the pedigrees of royal houses. But perhaps the most interesting manner in which coins and medals illustrate history is in their bearing contemporary, or nearly contemporary, portraits of the most famous kings and captains, from the time of the first successors of Alexander the Great to the present age, whereas pictures do not afford portraits in any number before the latter part of the Middle Ages; and works of sculpture, although occupying in this respect the same place as coins in the last-mentioned period and under the Roman empire, are neither so numerous nor so authentic. There is no more delightful companion in historical reading than a cabinet of coins and medals. The strength and energy of Alexander, the ferocity of Mithridates, the philosophic calmness of Antoninus, the obstinate ferocity of Nero, and the brutality of Caracalla, are as plain on the coins as in the pages of history. The numismatic portraits of the time following the founding of Constantinople have less individuality; but, after the revival of art, they recover that quality, and maintain it to our own day, although executed in very different styles from those of antiquity. From this last class we can form a series of portraits more complete and not less interesting than those of the ancient period.

While coins and medals thus illustrate the events of history, they have an equally direct bearing on the belief of the nations by which they were issued; and in this reference lies no small part of their value in connection with history. The mythology of the Greeks, not having been fixed in sacred writings, nor regulated by a dominant priesthood, but having grown out of the different beliefs of various tribes and isolated settlements, and having been allowed to form itself comparatively without check, can scarcely be learned from ancient books. Their writings give us but a partial or special view of it, and modern authors, in their attempts to systematize, have often but increased the confusion.

The Greek coins, whether of kings or cities, until the death of Alexander bear sacred subjects only. Afterward, on the regal coins, the king's head usually occupies the obverse and a sacred subject is placed on the reverse. The coins of Greek cities under the empire have usually an imperial portrait and a reverse type usually mythological. The whole class thus affords us invaluable evidence for the reconstruction of Greek mythology. We have nowhere else so complete a series of the different types under which the divinities were represented.

Coins are scarcely less valuable in relation to geography than to history. The position of towns on the sea or on rivers, the race of their inhabitants, and many similar particulars are positively fixed on numismatic evidence. The information that coins convey as to the details of the history of towns and countries has a necessary connection with geography, as has also their illustration of local forms of worship. The representations of natural productions on ancient money are of special importance, and afford assistance to the lexicographer. This is particularly the case with the Greek coins, on which these objects are frequently portrayed with great fidelity.

The art of sculpture, of which coin-engraving is the offspring, receives the greatest illustration from numismatics. Not only is the memory of lost statues preserved to us in the designs of ancient coins, but those of Greece afford admirable examples of that skill by which her sculptors attained their great renown. The excellence of the designs of very many Greek coins struck during the period of the best art is indeed so

great that, were it not for their smallness, they would form the finest series of art studies in the world. The Roman coins, though at no time to be compared to the purest Greek, yet represent worthily the Græco-Roman art of the empire. The mediæval Italian medals are scarcely less useful as records of the progress and characteristics of art, and, placed by the side of the Greek and Roman coins, complete the most remarkable comparative series of monuments illustrating the history of the great schools of art that can be brought together. Ancient coins throw as great light upon the architecture as upon the sculpture of the nations by which they were struck. Under the empire, the Roman coins issued at the city very frequently bear the representations of important edifices. The Greek imperial coins struck in the provinces present similar types, representing the most famous temples and other structures of their cities, of the form of some of which we should otherwise have been wholly ignorant.

After what has been said it is not necessary to do more than mention how greatly the study of coins tends to illustrate the contemporary literature of the nations which issued them. Not only the historians, but the philosophers and the poets, are constantly illustrated by the money of their times. This was perceived at the revival of letters; and during the last two centuries coins were very frequently engraved in the larger editions of the classics.

The science of numismatics is of comparatively recent origin. The ancients do not seem to have formed collections, although they appear to have occasionally preserved individual specimens for their beauty. Petrarch has the credit of having been the first collector; but it is probable that in his time ancient coins were already attracting no little notice. The importance of the study of all coins has since been by degrees more and more recognized, and at present no branch of the pursuit is left wholly unexplored.

Besides its bearing upon the history, the religion, the manners, and the arts of the nations which have used money, the science of numismatics has a special modern use in relation to art. Displaying the various styles of art prevalent in different ages, coins supply us with abundant means for promoting the advancement of art among ourselves. If the study of many schools be at all times of advantage, it is especially so when there is little originality in the world. Its least value is to point out the want of artistic merit and historical commemoration in modern coins, and to suggest that modern medals should be executed after some study of the rules which controlled the great works of former times.

A *coin* is a piece of metal of a fixed weight, stamped by authority of government, and employed as a circulating medium.

A *medal* is a piece, having no place in the currency, struck to commemorate some event or person. Medals are frequently comprised with coins in descriptions that apply to both equally; thus, in the subsequent definitions, by the term coins, coins and medals must generally be understood.

The coinage of a country is usually divided into the classes of gold, silver, and bronze (copper), for which the abbreviations *Al*, *AR*, and *Æ* are employed in catalogues.

Whatever representations or characters are borne by a coin constitute its *type*. The subject of each side is also called a *type*, and, when there is not only a device but an inscription, the latter may be excluded from the term. This last is the general use. No distinct rule has been laid down as to what makes a difference of type, but it may be considered to be an essential difference however slight.

A difference too small to constitute a new type makes a variety. A coin is a duplicate of another when it agrees with it in all particulars but those of exact size and weight. Strictly speaking, ancient coins are rarely, if ever, duplicates, except when struck from the same die. Of the two sides of a coin, that is called the *obverse* which bears the more important device or inscription. In early Greek coins it is the convex side; in Greek and Roman imperial it is the side bearing the head; in mediæval and modern, that bearing the royal effigy, or the king's name, or the name of the city; and in Oriental, that on which the inscription begins. The other side is called the *reverse*. The *field* of a coin is the space unoccupied by the principal devices or inscriptions. Any detached independent device or character is said to be in the field, except when it occupies the exergue.

No uniform system has as yet been applied to the arrangement of all coins. It is usual to separate them into the three great classes of ancient coins (comprising Greek and Roman), mediæval and modern, and Oriental coins. The details of these classes have been differently treated, both generally and specially. The arrangement of the Greek series has been first geographical, under countries and towns, and then chronological, for a further division; that of the Roman series, chronological, without reference to geography; that of the mediæval and modern, the same as the Greek; and that of the Oriental, like the Greek, but unsystematically—a treatment inadmissible except in the case of a single empire.

NUMMULITE. See FORAMINIFERA.

NUN. See MONACHISM.

NUNCIO, or NUNTIIUS APOSTOLICUS. See LEGATE.

NUNEATON, a market-town of Warwickshire, England, is situated near the Leicestershire border, ninety-seven miles northwest of London and twenty-two east of Birmingham. The population of the urban sanitary district (area 6,021 acres) in 1901 was 9,001.

NUNEZ or NONIUS, PEDRO, Portuguese cosmographer, was born at Alcacor do Sal in 1492, and died at Coimbra, where he was professor of mathematics, in 1577.

NUNEZ CABEZA DE VACA, ALVARO, Spanish explorer, was the lieutenant of Pamfilo Narvaez in the expedition which sailed from Spain in 1527, when Narvaez was lost in the Gulf of Mexico. He was born about 1490 and died in 1564.

NUREMBERG (in German, *Nürnberg*), the second town of Bavaria in size and the first in commercial importance, is situated in the district of Middle Franconia, in a sandy but well-cultivated plain, ninety-five miles to the northwest of Munich. It is divided by the small river Pegnitz into two parts, called respectively the *Lorenzseite* and the *Sebalderseite*, after the two principal churches.

Formerly among the richest and most influential of the free imperial towns, Nuremberg is one of the few cities of Europe that have retained their mediæval aspect substantially unimpaired. It is still surrounded with its ancient feudal walls and moat, though of late several breaches have been made to meet the exigencies of modern traffic. Of the 365 towers which formerly strengthened the walls, nearly 100 are still *in situ*, and a few of the interesting old gateways have also been preserved. Most of the streets are narrow and crooked, and the majority of the houses have their gables turned toward the street. The general type of architecture is Gothic, but the rich details, which are lavished with especial freedom in the interior courts, are usually borrowed from the Renaissance. Most of the private dwellings date from the sixteenth century, and there are

almost none of earlier date than the fifteenth century. Altogether it is difficult to conceive of a more piquant contrast than that afforded by the two chief towns of Bavaria—Munich, stamped with the brand-new impress of the nineteenth century, and Nuremberg, presenting a faithful picture of a well-to-do town of 300 years ago.

A good survey of this interesting town may be obtained from the old burg or castle, picturesquely perched on the top of a rock on the north side of the town. It is supposed to have been founded by the emperor Conrad II. about the year 1024, and dates in its present form mainly from the reign of Frederick Barbarossa (c. 1158). The castle of Nuremberg was a favorite residence of the emperors of Germany, and the imperial regalia were kept here from 1242 to 1806.

Nuremberg contains numerous interesting churches, the finest of which are those of St. Lawrence, St. Sebald, and Our Lady, three Gothic edifices of the thirteenth-fifteenth centuries.

The charitable, educational, scientific, and artistic institutions of Nuremberg are on a scale worthy of its ancient dignity. The Germanic National Museum, established in an old Carthusian monastery, has one of the most important historical collections in Germany. It includes a picture gallery with works by Holbein, Dürer, Wohlgemuth, etc. The Bavarian Industrial Museum is also a very creditable institution. The municipal library contains about 800 manuscripts and 50,000 printed books, some of which are of great rarity.

Though not of so great relative importance as of yore, Nuremberg still occupies a high place among the industrial and commercial centers of Europe. The principal manufactures are lead pencils, colors, gold and silver wire, gold and silver foil, railway plant, tobacco, playing-cards, and lastly the "Dutch" toys and fancy articles in metal, carved wood, ivory, etc., which are collectively known as "Nuremberg" wares.

The population of Nuremberg at the height of its prosperity has been estimated at as high a figure as 150,000, but there seems good reason to believe that it did not exceed 40,000 to 50,000 souls. In 1818 it had sunk to 27,000, but since then it has steadily increased. At the census of 1880 the town contained 99,519 inhabitants, 76,886 of whom were Protestants, 19,143 Roman Catholics, and 3,032 Jews. It had risen to 261,022 at the beginning of 1901.

NURSIA. See SABINES.

NUT. The term nut is applied to that class of fruit which consists generally of a single kernel inclosed in a hard shell. Botanically speaking, nuts are one-celled fruits with hardened pericarps, more or less enveloped in a cupule or cup, formed by the aggregation of the bracts. In commerce, however, the term has a wider application and embraces many fruits having hard woody indehiscent shells or coverings without reference to their inclosed seeds or kernels, besides leguminous pods, and even tuberous roots. A great number of nuts enter into commerce for various purposes, principally as articles of food or sources of oil, and for several ornamental and useful purposes. For the most part the edible nuts are very rich in oil, with only a small percentage of the other carbohydrates, starch, sugar, etc., and they also contain a large proportion of nitrogenous constituents. Thus possessing rich nutrient principles in a highly concentrated form, nuts are by themselves rather difficult of digestion, and the liability of many of them to become rancid is also a source of danger and hindrance to their free use. Oleaginous nuts used for food are likewise employed more or less as sources of oil, but on the other hand there are many oil-nuts of commercial importance not embraced in the list of edible nuts.

NUTIATION. See **ASTRONOMY.**

NUTCRACKER, the name given by Edwards in 1758 to a bird which had hitherto borne no English appellation, though described in 1544 by Turner. The nest of the Nutcracker seems to be invariably built on the bough of a tree, some twenty feet from the ground, and is a comparatively large structure of sticks, lined with grass. The eggs are of a very pale bluish-green, sometimes nearly spotless, but usually more or less freckled with pale olive or ash-color. The chief food of the Nutcracker, though it at times searches for insects on the ground, appears to be the seeds of various conifers, which it extracts as it holds the cones in its foot, and it has been questioned whether the bird has the faculty of cracking nuts—properly so called—with its bill, though that can be used with much force and, at least in confinement, with no little ingenuity.

NUTHATCH, in older English **NUTHACK**, from its habit of hacking or chipping nuts, which it cleverly fixes, as though in a vise, in a chink or crevice of the bark of a tree, and then hammers them with the point of its bill till the shell is broken. Without being very plentiful anywhere, it is generally distributed in suitable localities throughout its range—those localities being such as afford it a sufficient supply of food, consisting during the greater part of the year of insects, which it diligently seeks on the boles and larger limbs of old trees; but in autumn and winter it feeds on nuts, beechmast, the stones of yew-berries, and hard seeds. It generally makes its nest in a hollow branch, plastering up the opening with clay, leaving only a circular hole just large enough to afford entrance and exit; and the interior contains a bed of dry leaves or the filmy flakes of the inner bark of a fir or cedar, on which the eggs are laid. In the Levant occurs another species, *S. syriaca*, with somewhat different habits, as it haunts rocks rather than trees, and four or five representatives of the European arboreal species have their respective ranges from Asia Minor to the Himalayas and Northern China. North America possesses nearly as many; but, curiously enough, the geographical difference of coloration is just the reverse of what it is in Europe—the species with a deep rufous breast, *S. canadensis*, being that which has the most northern range, while the white-bellied *S. carolinensis*, with its western form, *S. aculeata*, inhabits more southern latitudes.

NUTMEG. The spice known in commerce under this name is the kernel of the seed of *Myristica fragrans*, Houtt., a dioecious evergreen tree, about fifty to sixty feet high, found wild in the Banda Islands and a few of the neighboring islands, extending to New Guinea, but not to the Philippines. Nutmeg and mace are almost exclusively obtained from the Banda Islands, although the cultivation has been attended with varying success in Singapore, Penang, Bengal, Réunion, Brazil, French Guiana, and the West Indies. The trees yield fruit in eight years after sowing the seed, reach their prime in twenty-five years, and bear for sixty years or longer. Almost the whole surface of the Banda Islands is planted with nutmeg trees, which thrive under the shade of the lofty *Canarium commune*. In Bencoolen the tree bears all the year round, but the chief harvest takes place in the later months of the year, and a smaller one in April, May, and June. The ripe fruit is about two inches in diameter, of a rounded pear-shape, and when mature splits into two halves, exposing a crimson arillus surrounding a single seed. When the fruit is collected the pericarp is first removed; then the arillus is carefully stripped off and dried, in which state it forms the mace of commerce. The seed consists of a thin, hard testa or shell inclosing a kernel, which, when dried, is the nutmeg. To prepare the nutmegs for use,

the seed inclosing the kernel is dried at a gentle heat in a drying-house over a smoldering fire for about two months, the seeds being turned every second or third day. When thoroughly dried the shells are broken with a wooden mallet or flat board and the nutmegs picked out and sorted, the smaller and inferior ones being reserved for the expression of the fixed oil which they contain, and which forms the so-called oil of mace.

"Oil of mace," or nutmeg butter, is a solid fatty substance of a reddish-brown color, obtained by grinding the refuse nutmegs to a fine powder, inclosing it in bags and steaming it over large caldrons for five or six hours, and then compressing it while still warm between powerful wedges, the brownish fluid which flows out being afterward allowed to solidify. Nutmegs yield about one-fourth of their weight of this substance. It is partly dissolved by cold alcohol, the remainder being soluble in ether. The latter portion, about 10 per cent. of the weight of the nutmegs, consists chiefly of *myristin*, which is a compound of *myristic acid*, with glycerine. Nutmeg butter yields on distillation with water a volatile oil to the extent of about 6 per cent., consisting almost entirely of a hydrocarbon. It is accompanied by a small quantity of an oxygenated oil, *myristical*, isomeric with carvol, but differing from it in not forming a crystalline compound with hydrosulphuric acid. Mace contains a similar volatile oil, *macene*, which is said by Clœz to differ from that of nutmegs in yielding a solid compound when treated with hydrochloric acid gas.

NUTRITION. By the term nutrition, employed in its widest sense, is understood the process, or rather the assemblage of processes, concerned in the maintenance and repair of the living body as a whole, or of its constituent parts or organs. The term has, however, usually been limited in systematic treatises on physiology to a study, mainly statistical, of the relations which exist between a living being and the medium which it inhabits, embracing a determination of the gains and losses of the organism under the different conditions to which it may be exposed. Such a statistical study has already been pursued in the article **DIETETICS**, and we shall therefore, in the present article, restricting our attention to the animal kingdom, consider nutrition in the more general sense above referred to, including—(1) a study of the function of digestion; (2) a sketch of the processes concerned in the absorption of matter into the blood; (3) an account of the chemical processes which have their seat in the tissues and organs of the body; (4) an account of the processes whereby redundant matters, or such as are the products of waste, are removed from the animal economy; (5) a reference to the transformations of energy which are associated with the exchange of the matters of the body; (6) a brief reference to the processes of growth, decay, and death.

There is no conception which we can form in reference to a living being, however rudimentary its structure, which is so general as the following:—A living animal, so long as it manifests those attributes which characterize it as living, is the seat of continual transformations of potential into kinetic energy.

Such transformations are connected with oxidation of organic matters which, primarily derived from the vegetable kingdom, have been *assimilated*, i.e., have been converted into the substance of the animal, and are effected through the agency of oxygen gas introduced into the body in the process of respiration. The act of living is an act of combustion in which the animal body actually burns, and the energy at the disposal of the body, and which is employed in raising its temperature or effecting the movements which are essential to its continued life, is energy which was potential in the

organic constituents burned. The main products of the combustion of the body are carbonic acid and water, besides certain other less completely oxidized substances, which are the analogues of the sooty and tarry products of combustion in a furnace. Of these products some, as carbonic acid and a part of the water formed, are removed from the body almost as soon as they are formed, while others are thrown off at intervals.

It follows from what has been stated that the act of living necessarily implies not only transformation of energy but actual waste of the matter of the body, and that if an animal is continuously to manifest the phenomena of life it must be supplied with oxidizable organic matter to take the place of that which has been oxidized. Accordingly, animal life is impossible unless the creature, besides receiving continual supplies of oxygen gas, receives at intervals supplies of food. The food of an animal consists (1) of oxidizable organic matters which, although they may have been derived in part or wholly from some other animal body, have primarily been built up through the instrumentality of vegetable organisms—these organic matters belong to a few well-defined groups; (2) of mineral matters, including large quantities of water, which form an important part of the substance of the body, and the presence in and passage of which through the organism is essential to the physical processes which have their seat in it.

In brief, the animal body is the seat of processes of disintegration associated with the manifestation of kinetic energy, and of processes of integration in which oxidizable matters take the place of the oxidized constituents. If life is to continue, in a sense, indefinitely, it is essential that the processes of integration and disintegration should balance, *i.e.*, that the receipts of the body in assimilable oxidizable matter should balance the expenditure of the body in both matter and energy. There are, it will be observed, very close analogies between an animal and such a mechanism as a steam-engine, the energy at the disposal of both being primarily derived from the oxidation of combustible matters. Some of the most salient points of difference must, however, not be lost sight of. (1) The waste of the essential parts of such a machine as a steam-engine is insignificant, and bears no definite relation to the work done. The kinetic energy of the machine is primarily due to oxidation processes taking place in the furnace, and in no respect to changes in the substance of the machine. The animal, on the other hand, wastes continuously in all its parts and organs, and much of its energy is derived immediately from material which has become part and parcel of the various mechanisms. (2) Any substance capable of being rapidly oxidized (burned), and thus of generating heat, may be used as fuel for a steam-engine, provided its combustion admits of being conducted with safety in its furnace, while the substances which can form the food of animals belong in a limited number of groups, which include but a comparatively small number of bodies. The constituents of food have not only to supply energy to the body, but they must further be capable of prior conversion into the very substance of the animal body, into its very "flesh and blood."

Moreover, the constituents of food must be free from all traces of the peculiar substances which we term "poison," and which by their presence have the power of impairing and arresting the action of various organs of the body.

Hunger and Thirst.—These terms are used to express peculiar sensations which are produced by and give expression to general wants of the system, satisfied respectively by the ingestion of organic solids contain-

ing substances capable of acting as food, and by water or liquids and solids containing water. Hunger is a peculiarly indefinite sensation of craving or want which is referred to the stomach, but with which is often combined, always indeed in its most pronounced stages, a general feeling of weakness or faintness. The earliest stages are unattended with suffering, and, leading the animal to wish and seek for food, are characterized as "appetite for food." Hunger is normally appeased by the introduction of solid or semi-solid nutriment into the stomach, and it is probable that the almost immediate alleviation of the sensation under these circumstances is in part due to a local influence, perhaps connected with a free secretion of gastric juice. Essentially, however, the sensation of hunger is a mere local expression of a general want, and this local expression ceases when the want is satisfied, even though only liquid and no solid food is introduced into the stomach, or even though no food be introduced into the stomach, the needs of the economy being satisfied by the introduction of food through other channels, as, for example, when food which admits of being readily absorbed is injected into the large intestine.

Thirst is a peculiar sensation of dryness and heat localized in the tongue and throat. Although thirst may be artificially produced by drying, as by the passage of a current of air over the mucous membrane of the above parts, normally it depends upon an impoverishment of the system in water. And, when this impoverishment ceases, in whichever way this be effected, the sensation likewise ceases. The injection of water into the blood, the stomach, or the large intestine appeases thirst, though no fluid is brought in contact with the part to which the sensation is referred.

The sensations the causes of which we have briefly attempted to trace lead us, or when urgent compel us, to take food and drink into the mouth. Once in the mouth, the entrance to the alimentary canal, the food begins to undergo a series of processes, the object of which is to extract from it as much as possible of its nutritive constituents. It cannot be sufficiently emphasized that food in the alimentary canal is, strictly speaking, outside the confines of the body; as much so as the fly grasped in the leaves of the insectivorous *Dionea* is outside of the plant itself. The mechanical and chemical processes to which the food is subjected in the stomach and intestines are processes which have their seat and conditions outside the body which it is destined to nourish, though unquestionably the body is no passive agent, and innumerable glands have to come into action in order to supply the chemical agents which shall dissolve and render assimilable those constituents of the food which are capable of being absorbed into the organism, and of forming part and parcel of its substance.

The processes to which the food is subjected, though manifold, are divisible into two great groups: (1) the food must be subjected to the action of certain juices which dissolve insoluble alimentary matters, and modify these no less than certain of the soluble alimentary substances; and (2) it must be mechanically mixed with those juices, and propelled more or less slowly from beginning to end of the alimentary canal. In accordance with this twofold function the alimentary canal is divisible into two distinct but intercalated anatomical tubes—(1) an internal tube of mucous membrane, and (2), investing this closely, an external muscular tube.

When food is introduced into the mouth it is submitted to the operation of mastication. After the food has been reduced to a proper consistency by the combined influence of the mechanical movements of the jaws, tongue, and cheeks, and the action of the saliva,

It is rolled into a mass or bolus ready for swallowing. By the approximation of the tongue to the palate the angle is lessened and the bolus is, in consequence, driven backward. This constitutes the first stage in the act of swallowing, and is a voluntary act. At the end of the first stage the morsel of food has passed beyond the level of the anterior pillars of the fauces. The acts of the second stage are very complicated, and probably are entirely involuntary. Once in the gullet, the mass of food is driven downward by the so-called "peristaltic" movements of the tube—the circular fibers contract one after another from the above downward, lessening the caliber of the tube in successive stages, while the longitudinal fibers seem to have the function of drawing the tube over the bolus as a stocking is drawn over the foot. At the entrance of the stomach the food meets the barrier opposed by the contracted cardiac orifice; the contraction must be overcome before the food can gain admittance. The relaxation is certainly an active process under the control of medulla oblongata through the vagus nerve, since section of the vagi causes a block to the progress of food from the oesophagus into the stomach.

In the stomach the food is detained for a period which varies very greatly with its digestibility, but which in the human subject is not often longer than four or five hours. It is subjected to a rubbing and rolling action of the stomach-walls and a modified peristalsis, which causes the food to move slowly from the cardiac orifice along the greater curvature to the pylorus, whence it returns along the small curvature to the cardiac end again. The gastric movements are slight at first, but gradually increase in vigor. The pylorus is tightly closed at the beginning of a meal, but becomes more and more relaxed as digestion proceeds, so that, while at first only the finer parts of the gastric contents can pass, afterward the coarser parts and even solid lumps of imperfectly-digested aliments are permitted to escape into the duodenum. We possess little accurate knowledge as to the nervous mechanism of the stomach. All that we know is (1) that movements of an excised stomach are induced with great difficulty, (2) that stimulation of the vagus will often cause movements of the stomach, and (3) that section of the vagi impedes the passage of food out of the stomach. The movements of the stomach have been said to cease altogether during sleep.

When the gastric contents, to which the term chyme is often applied, pass through the pylorus into the duodenum, they begin to move onward by the pure peristaltic action of the small intestines. The powerful annular fibers contract one after another, driving the food onward, as water may be squeezed along an india-rubber tube by the compression of the hand. The longitudinal fibers contract in such a manner that the intestine is drawn over the advancing mass. The movements always occur (in health at least) in a direction from the stomach to the ileo-cæcal valve; here they stop and never pass as a continuous wave to the large intestine.

After passing through the ileo-cæcal valve the intestinal contents, which have been very greatly diminished in amount owing to the process of absorption that has gone on, quickly assume the characteristic appearance of fæces. The undigested and insoluble parts of the food, mixed with mucus, with epithelial debris, and with some substances derived from the secretions of the alimentary canal, notably with some biliary products, must be cast out; this is effected by the act of defæcation. The anus is normally kept firmly closed by the contraction of two sphincter muscles—the external, which is one of the skeletal muscles, and the internal, which is formed by a

special development of the lowest rings of the circular layer of muscles of the intestine. In the act of defæcation these sphincters are relaxed, while the contraction of the rectum forces its contents downward. The levatores ani are brought into play by the will and exert an action similar to that previously referred to as performed by the longitudinal fibers of the intestine. Of special influence in aiding the expulsion of the contents of the bowel is the contraction of the abdominal muscles which follows a preliminary fixation of the diaphragm by a deep inspiration.

The act of defæcation is essentially a reflex act. The center which presides over the sphincters of the anus lies in the lumbar portion of the spinal cord. This center is under the control of the brain, under the influence of which its activity is either increased or inhibited.

Vomiting, or the ejection of the contents of the stomach through the mouth, is an act of considerable complexity; (1) the cardiac orifice of the stomach is relaxed or, to be accurate, thrown open by the operation of some reflex nervous mechanism with which the vagus is connected; (2) contraction of the muscular coat of the stomach occurs; (3) the abdominal walls are powerfully compressed, and the diaphragm is at the same time strongly fixed by closure of the glottis. As concurrent phenomena in ordinary vomiting may be mentioned the sense of nausea and the free flow of saliva which occurs during and indeed before the act.

Vomiting may, within certain limits, be inhibited by taking a series of deep and rapid inspirations at a time when the sense of nausea is becoming unbearable.

True vomiting seems to be impossible without the aid of the abdominal muscles, as, for example, when the abdomen is laid open. In such conditions emetics cause active opening of the cardiac orifice and movements of the stomach-walls, but not the full and free expulsion of the contents. Vomiting is usually a reflex act, the center for which lies in the medulla oblongata, near the center for respiration, though it is reasonable to suppose that it may occur not only as a reflex act but as a result of direct stimulation of the center or centers associated with it.

We have described the movements of the alimentary tube by which the food is triturated and agitated, and finally propelled from mouth to anus. One object of these movements is to mix together the food and certain solvent juices which are poured upon the food at various points.

Besides the proteolytic and amylolytic ferments, there occur in the alimentary canal a *curdling* ferment, an *inverting* ferment, and perhaps a *fat-decomposing* ferment.

All enzymes exert a more energetic action at a moderately high than at a low temperature, though the influence of a rise in temperature is more marked in some cases than in others. The reaction of the medium in which they are placed influences remarkably the activity of certain enzymes; thus pepsin, the proteolytic ferment of the stomach, is inactive in neutral or alkaline solutions, the presence of a free acid being essential to its activity, while trypsin, the proteolytic ferment of the pancreas, acts with feebleness in solutions which are neutral or faintly acid, since it needs for the full exercise of its powers a decidedly alkaline medium. The enzymes appear to possess the power of rapidly inducing, at the temperature of the animal body, in bodies subjected to them, similar chemical operations to those which can be brought about with great slowness by prolonged heating with dilute mineral acids, or by the prolonged action of boiling water or superheated steam. These operations are of the nature of *hydro-*

lytic decomposition, that is to say, such as are connected with the union of the elements of water with the decomposing body.

There are no secreting glands in the body which have been subjected to so elaborate a study as the salivary glands, whether we consider their structure or the circumstances which influence or accompany the act of secretion. The saliva is secreted by several glands of which the ducts pour their secretion into the cavity of the mouth, where it is mingled and constitutes the "mixed saliva." The chief of these glands are the parotid, the submaxillary, and the sublingual glands, though their secretion is mixed with that of small glands (mucous and serous) scattered through the mucous membrane of the mouth and tongue, which are included under the term "buccal" glands.

The salivary glands all belong to the group of acinous or compound racemose glands.

Each salivary gland is supplied by at least three classes of fibers, viz., secretory, vaso-constrictor, and vaso-dilator fibers, of which the first and third are conveyed to the glands in branches of cerebral nerves; these are, the chorda tympani for the submaxillary and sublingual, and the auriculo-temporal (which, however, derives them through communications with the otic ganglion from the glosso-pharyngeal nerve) for the parotid. The second class, the vaso-constrictor or vaso-motor fibers, run in sympathetic trunks. When, therefore, one of the cranial branches supplying a gland is stimulated there occur two acts, viz., secretion and simultaneous dilatation of blood-vessels; that these two acts are not absolutely interdependent is proved by the fact that certain drugs paralyze the one set of fibers, but leave the other intact. When, on the other hand, the sympathetic filaments supplying the gland are stimulated, the blood-vessels of the gland contract, and there is produced a small quantity of saliva differing in physical characteristics and chemical composition from that obtained under the circumstances first referred to. According to Heidenhain, however, in each of the two kinds of nerves supplying a salivary gland there exist, besides the vascular nerve-fibers, secretory and trophic fibers, though the number of one or the other of these classes may be insignificant—the secretory predominating in the cranial nerve branches, the trophic in the sympathetic. Stimulation of secretory fibers leads, according to Heidenhain, to an increased flow of water, stimulation of the trophic to an increased secretion of specific substances and to an increased production of protoplasm.

When a salivary gland passes from a state of rest into that of activity it is at once the seat of an increased blood flow, which is associated with the dilatation of the blood-vessels of the organ. Under these circumstances, the blood leaving the gland presents a florid arterial color, instead of the venous color which characterizes the blood of the organ when at rest. This vascular dilatation is explained by the coming into action of the before-mentioned vaso-dilator fibers; it is independent of the act of secretion.

The "mucous glands of the stomach," so called from their having been formerly erroneously supposed to be engaged in the secretion of mucus only, are situated chiefly at the pyloric end of the stomach. The "peptic glands" owe their name to the view that they alone secrete the digestive gastric juice, and are found in most animals in the mucous membrane of other parts of the stomach than the pylorus.

During active digestion the cubical cells of both pyloric glands and glands of the fundus become swollen and granular; after a period of rest they return to their original size and assume a comparatively clear appear-

ance. The ovoid cells also swell during digestion, but in other respects remain unchanged.

When the stomach is inactive, *i.e.*, in the fasting condition, its mucous membrane is pale and the organ contains no fluid; the mucous membrane in the pyloric region presents an alkaline reaction. When, however, food enters the stomach, or the mucous membrane is subjected to mechanical stimulation, an acid juice, the so-called gastric juice, is poured out, the act of secretion being accompanied by a reddening of the mucous membrane.

No accurate estimate can be formed of the amount of gastric juice secreted during twenty-four hours. It has been calculated to be between twenty and thirty pints. Secretion of gastric juice may occur after all the nerves going to the stomach have been divided, though it is for a time arrested after division of the pneumogastric nerves. It is probable that the process of gastric digestion is essentially under the control of an intrinsic nervous mechanism situated in the mucous membrane, though this is normally influenced by the higher nerve centers.

The secretion of the liver, the bile, is being continually formed, though not always at the same rate. In animals possessed of gall-bladder it is stored in the intervals of digestion in this reservoir. When food is taken into the stomach the bile begins to be secreted in larger quantities, the maximum being reached about six hours after the meal. As the so-called acid "chyme," to be afterward referred to, passes the opening of the bile-duct in the duodenum, it is probable that a stream of bile is poured upon it by the reflex of contraction of the gall-bladder. During the time when bile is being secreted much heat is evolved in the liver. The bile, as will be shown in the sequel, should be looked upon as a liquid containing only certain, for the most part useless, by-products resulting from great chemical operations going on in the liver. Little is known as yet of the exact changes which occur in the liver-cells during activity, nor of the manner in which the nervous system influences the secretion of bile.

The pancreas possesses a structure which presents great resemblance to that of serous salivary glands, and its alkaline secretion was until lately looked upon as closely resembling the saliva.

The cells of the pancreas elaborate a substance which is the antecedent of the proteolytic ferment, and which yields it when it passes into the pancreatic ducts; it is customary to speak of this body as *zymogen* or ferment-former, because it gives rise to one of the chief enzymes or ferments of the juice. The secretion of pancreatic fluid is slight except during digestion. After the taking of a full meal the secretion is suddenly exalted, reaching its maximum two or three hours afterward. The secretion then diminishes until a period which extends from the fifth to the seventh hour, when a rise occurs, which lasts to between the ninth and eleventh hours after food. The secretion then gradually sinks, until it absolutely ceases. Stimulation of the gastric mucous membrane starts the secretion of pancreatic juice; it is arrested during nausea and vomiting, as also when the central end of the divided pneumogastric is stimulated.

The mixed saliva of man is, when perfectly fresh, a clear, transparent, viscid liquid, which, on microscopic examination, is found to contain cells of squamous epithelium derived from the mouth, besides certain globular cells derived from the salivary glands and called "salivary corpuscles." Its reaction is alkaline; it has a specific gravity of about 1.003, and contains about five or six parts per thousand of solid matters.

The changes which are brought about by the action of the salivary ferment on the starchy constituent of food

are hastened by a temperature near that of the mammalian body. Boiling destroys the diastatic power, as also does the presence of strong acids or alkalis. A very feeble acid reaction does not absolutely stop the characteristic action. While the saliva of man and some few animals possesses the remarkable diastatic ferment just referred to, this is absent from the saliva of the majority of animals, so that we are forced to conclude that the saliva is an alimentary juice which subserves mechanical rather than essential chemical functions.

Gastric juice is a thin colorless or straw-colored liquid of strongly acid reaction, and of a mawkish taste. Its specific gravity varies between 1.001 and 1.010, and it contains from $\frac{1}{2}$ to 1 per cent. of solid matters.

The gastric juice contains free hydrochloric acid, certain mineral matters, and a ferment or enzyme called pepsin. The pepsin, which has never been separated in a pure condition, is soluble in water, weak spirit and glycerine, and confers upon all these solvents its characteristic property, viz., that of dissolving, in the presence of a dilute free acid, and at a suitable temperature, insoluble proteids, and of converting these into soluble and diffusible modifications termed peptones. Peptones differ from other albuminous or proteid bodies in their greater diffusibility, as well as in their much higher solubility in pure water. They are not coagulated by heat or by nitric acid, and are not thrown down by many mineral salts which precipitate other soluble proteids.

In addition to pepsin the gastric juice contains an entirely independent ferment which is called the "curdling ferment" or the "rennet ferment," because of its power of rapidly inducing at the temperature of the body the coagulation of the casein of milk, which it converts into cheese. Unlike pepsin, this ferment will act in solutions which contain no trace of free acid.

Bile is a bitter liquid of golden-red color in man and carnivorous animals, but green in herbivorous animals. It is commonly viscid owing to admixture with mucus derived from the walls of the gall-bladder and hepatic ducts. Its reaction is neutral or faintly alkaline. It contains about 14 per cent. of solid constituents.

The amount of bile secreted by man has been estimated at from about 136 grains to about 309 grains per kilogram (2.20 pounds) of body-weight; but in certain cases, through abnormal circumstances, the total amount of bile secreted in twenty-four hours has been found to be less than this, viz., to vary between about sixteen and twenty-one ounces.

The action of the bile in digestion, it must be admitted, seems trifling and out of proportion to the size of the gland and the amount of the secretion. It is a weak solvent for fats; it has the power of emulsifying fats, especially, perhaps, when added to the pancreatic juice; and it may help the passage of fat through animal membranes. At least it is certain that, when filter-paper is wetted with bile, oils filter through it more readily than when it is wetted with water. The most important use of the bile is, however, as an adjuvant to pancreatic digestion. The pancreatic juice contains a ferment which is either a proteid body or inseparably connected with a proteid body. Strangely, though this ferment possesses the power of dissolving proteids under suitable circumstances, in the presence of pepsin and any free acid it is itself destroyed. It would then be acted upon by the pepsin passing into the duodenum from the stomach if the conditions were favorable. To prevent this untoward accident the alkaline bile is poured over the acid contents of the stomach as they pass the duodenum; these are neutralized, and a precipitate is thrown down which mechanically entangles the pepsin that may be in the mixture. Although the definable uses of the

bile are small, the part which it plays in the economy is of essential importance. Animals whose bile is allowed to escape externally soon grow lean and ill-conditioned. The fat which should be absorbed in the alimentary canal remains in part in the feces, which acquire a peculiar putrescent odor. If we except the gastric juice, the chemical action exerted by the pancreatic juice is the most potent and useful of any of the digestive secretions.

When freshly secreted and perfectly normal, the pancreatic juice is a clear viscid liquid of strongly alkaline reaction and highly coagulable by heat. Its solid constituents may reach the proportion of 10 per cent.

The amylolytic or diastatic ferment of the pancreatic juice resembles that of the saliva in its action. While the saliva of most animals contains no such ferment, the pancreatic juice of all animals is very rich in diastatic ferment, so that the action of the pancreatic juice on starch is much greater than that of saliva.

Intestinal juice, which is also called not infrequently by its Latin name *succus entericus*, is a thin, yellowish, alkaline, albuminous liquid of specific gravity 1.01, concerning which we possess very little information. It has been said to act upon fibrin alone of the albuminous bodies; it not only contains a small quantity of diastatic ferment but probably also a so-called inverting ferment, possessing the power of converting cane-sugar into grape-sugar.

The food which is introduced into the mouth is an exceedingly complex substance. Leaving out of account those substances which are insoluble and incapable of absorption, and which are also not amenable to the influences of the digestive juices, we may classify the true food-stuffs as follows:—

(1) *Albuminous matters*, including (a) the true *proteids*, such as albumen of egg, casein of milk, myosin of muscle, fibrin of blood, etc., and (b) the *albuminoid bodies*, such as gelatin from tendons and bones, chondrin from cartilages, and elastin from various elastic structures; (2) *hydrocarbons or fats*, of which those chiefly used for food are stearin, olein, and palmitin; (3) *carbohydrates*; (4) the various *inorganic salts*; (5) *water*. The third group includes the *amyloids* or starch-like bodies; the *saccharoses* like cane-sugar, the *glucoses* like the grape-sugar and fruit-sugar found in honey and in ripe fruits, the sugar of milk, etc. In addition to these may be mentioned allied bodies, cellulose, pectin, arabin, mucilage, etc., which in some animals, or in some conditions, are certainly digestible. In a subdivision of the same group we may place the various vegetable acids, lactic, acetic, citric, malic, etc., which are essentially foods.

It may be premised that the fate which befalls a given example of ingested food does not depend solely upon the theoretical power of the digestive juices to act upon it. Thus digestible food may be imperfectly digested owing to being passed into the stomach in lumps and masses, which the juices cannot permeate and the stomach cannot crush; or starch may be so incorporated and encapsuled with fat that the saliva and even the pancreatic juice may fail to reach it; or digestion from one cause or another may be so prolonged that fermentative changes, to which most samples of food are inevitably liable from containing organized ferments or "germs," may have time to begin and to alter materially the sequence of events. Hence we shall feel no surprise that much food escapes altogether the action of digestion. The most perfect and economical feeding is that in which the least quantity of food is passed through the alimentary canal unchanged. When, however, the just quantity is taken, and the digestive organs are sound, the following is the order of the changes which occur.

Food placed in the mouth at once excites the flow of mixed saliva and mucus. Solid food is broken up, rubbed together with the juices of the mouth and entangled air-bubbles, and rolled into a slimy bolus. Soluble constituents of it thus have an opportunity of becoming dissolved at once; sugar, dextrin, vegetable acids, and many inorganic salts would, in part at least, pass into solution in the mixed saliva. The process of mastication, besides triturating the food and mixing it with the alkaline saliva, permits it to become raised nearly to the body-temperature, in which condition the dextrin and the starches readily fall a prey to the ptyalin, and begin to be converted into dextrins and maltose. This change is very rapidly effected—it begins instantly if the starch is already boiled, so that, unless the food is "bolted," a considerable quantity of soluble dextrin and sugar is formed before the bolus is swallowed. The act of deglutition passes the softened bolus into the stomach, where already a certain quantity of acid gastric juice is ready to receive it. The presence of food in the stomach is a greater stimulus to the gastric flow than its presence in the mouth; the juice is more rapidly secreted, but still it is comparatively poor in pepsin and still more so in free acid; but after a time, as more food is added, and as the first-coming food begins to be dissolved and absorbed, the proportion of pepsin is increased. The movements of the stomach mix intimately the acid juice and the alkaline food; the first effect of this is a neutralization of the mass, but, as the secretion of juice goes on for some time after the last portion of an ordinary meal has been swallowed, the mass becomes more and more acid. The amylolytic action of the swallowed saliva is gradually checked, and the still unchanged starch remains unchanged so long as it lingers in the stomach.

The presence of food in the stomach is of itself a stimulus to the secretion of bile and pancreatic fluid; by the time, therefore, that the chyme passes into the duodenum, a considerable quantity of the fresh juices is prepared for it. Not only so; the contact of the acid chyme with the duodenal membrane at once brings on a reflex contraction of the ducts and gall-bladder of the liver, by which a sharp stream of alkaline fluid is at once poured out, wherewith the chyme is drenched. So far as the mixture is made perfect and the point of neutralization is reached, a precipitate of parapeptones and peptones is formed, carrying down with it the active pepsin. But the acidity of the chyme is not at once overcome; not until the middle of the small intestine is reached does the acid reaction entirely disappear; and we may therefore assume that a kind of exotic gastric digestion may go on in the parts of chyme which still remain acid. But whenever the reaction ceases to be strongly acid the pancreatic juice takes up the work of digestion. Proteids are changed into soluble peptones, and the conversion of starch into dextrin and maltose begins again with redoubled vigor. Fats are seized upon, resolved into glycerin and their fatty acids, and emulsified both by bile and by pancreatic fluid. The resulting fatty acids combine with the alkalis of the mass to form soaps, which in turn aid the process of emulsification. The chyme, which, from being gray, became of a golden-orange color when saturated with bile, acquires a decidedly cream-like appearance from the emulsion that is formed.

As the remnant of food passes down the intestine, changes allied to putrefaction invariably occur. Lactic acid is always to be detected in the small intestine, and the amount of it increases as the ileo-cæcal valve is approached. Possibly the butyric acid fermentation likewise occurs as a constant, if not an essential, phenomenon of intestinal digestion. At least the gases of

the small intestine always contain a small amount of hydrogen; but if we are to gauge the butyric acid fermentation by the amount of hydrogen detected, we must assume it to be of very small proportions. We are so ignorant of the nature of the enteric or intestinal juice that we need not here speculate as to the changes in the remnant of food which the addition of it may bring about. Let it suffice to say that the intestinal contents pass through the ileo-cæcal valve with none of the odor and little of the appearance of fecal matter. While in the large intestine they become reduced in bulk, and approach a solid consistency by the abstraction of water from them. Their reaction becomes distinctly acid once more; but now, from inward processes of putrefaction and fermentation which were started already in the small intestine, putrefactive gases may arise, light carbureted hydrogen, carbonic acid, sulphureted hydrogen, nitrogen, and hydrogen. The fæces themselves are commonly acid; besides the indigestible parts of food, such as horny matter and cellulose (the denser sorts at least), and the undigested but digestible overplus of starch, proteid, etc., they contain derivatives from the bile which cause the characteristic color, and some final decomposition products of elements of food, such as indol.

The complex processes of digestion result in the conversion of insoluble and indiffusible food-stuffs into soluble and diffusible sugars and peptones. These, with the soluble saline matters, the finely-divided or emulsified fats and water, are (if we except the small quantity of soaps formed in the course of pancreatic digestion, and the small amount of soluble leucin and tyrosin evolved in the same process) the only contents of the alimentary canal capable of entering the organism from the outer world. They are not, indeed, the only soluble and absorbable bodies in the intestine; a large part of the digestive juices themselves are reabsorbed, and may possibly do duty over again in their respective secretions. But these are not foods. How, it may now be asked, do these soluble or finely-divided substances pass the confines of the body? From what has already been said about the organs of digestion it will be evident that, from the stomach downward, the alimentary cavity is separated from an infinite number of thin-walled vessels by a delicate layer of columnar epithelium and a filmy basement membrane. There seems at first sight to be no difficulty in understanding how water and dissolved and diffusible matters may pass these barriers with the greatest readiness by physical processes of diffusion which are so simply imitated in the laboratory. We know also that, in fact, solutions do with the greatest ease and rapidity pass through such a membrane as the conjunctiva, by the readiness with which the pupil may be dilated on putting a drop of atropinized fluid beneath the eyelid. But it is by no means clear that the process is so simple in the living intestine. A fresh specimen of epithelium scraped from the interior of the mouth of a pig may be bathed in a solution of coloring matter and yet admit no trace of the color into the substance of its cells so long as they remain alive. It is only when they cease to be living protoplasm that the physical processes of diffusion come into play and that the cell-substance takes up the color. Guided by this simple observation, we shall hesitate to assume, because we have water containing soluble sugars, salts, and peptones on one side of the epithelium of the alimentary tract, while on the other we have fluids differently constituted, that, therefore, we must needs have a process of transfusion tending to the passage of the dissolved substances from one side to the other. This "absorption" of matters, even simple saline solutions, at the surface of the intestine, may be, and most

probably is, a vital operation. Once through the epithelial layer the absorbed matters pass into the blood-vessels or the lymphatics in some way the details of which are as yet mere matters of speculation.

While it is probable that the liver modifies the recently-digested raw material of food before it reaches the common stock of the blood, it is quite unknown what (or, indeed, if any) difference exists between the action of the liver on blood laden with raw material immediately after a meal and its action on blood traversing its capillaries during a fast. Does the liver exert an action on recently-imported fat, peptones, and sugar in any sense different from the action it exerts on fatty, albuminous, and sugary matters as they exist in the common stock of blood? Or—which is the same question—do the fats, albuminous matters, and sugars of the portal blood differ at all from the fats, albuminous matters, and sugars of ordinary blood? While this question remains unanswered it will be well to consider the liver as like any other tissue drawing on the common source of nutriment, the blood, for its own particular purposes, and not as an organ akin to the special digestive organs, devoted to the elaboration of food for the benefit of the other tissues.

It need not be so, however, with the lymphatic structures with which the chyle of the lacteals comes into contact before it is poured into the blood. Chyle from the thoracic duct at its entrance into the veins is of course mixed with the general lymph of the body—the juice of the tissues which is collected in the lymph-vessels and carried back to the blood. It is a milky fluid which coagulates on standing, the clot of which after some time becomes tinted red at the surface from the presence of immature red corpuscles. The coagulum consists of fibrin resembling that of the blood. Other constituents of chyle are white corpuscles, oil-globules coated with albuminous matter, *i.e.*, emulsified, and exceedingly fine fatty granules usually spoken of as the “molecular basis of chyle.” Chyle obtained from vessels nearer the intestines has very little fibrin, very few white corpuscles, and no red corpuscles. It is probable, therefore, that the raw matters of digested food are undergoing a process of manufacture into blood during their passage through the lymphatic glands to reach the thoracic duct.

When once they arrive at the blood, the imported materials of food are lost beyond our power to follow them individually. The question now becomes one of the interchanges between the blood generally and the tissues. That such an interchange occurs there can be no doubt; for if all food be withheld from an animal the tissues rapidly grow less in quantity, while the blood maintains a fairly constant composition. If such an animal be fed, the tissues regain their former weight, and may even store up an overplus of matters, while again the blood remains of approximately constant composition. The tissues can both take away from the blood and give to the blood such matters as are necessary. But the matters taken from the blood are not in the same form as the matters given up to the blood. When blood is made to circulate through living tissues of whatever kind the blood entering the tissue always has a different composition from the blood which leaves it. The tissues, therefore, are laboratories in which materials abstracted from the blood are transformed. To these chemical operations of transformation which occur in living tissues the term “metabolic” has been applied, a term first used by Schwann, and reintroduced by Michael Foster.

What now becomes of the products of the metabolic activity of the tissues? We have hitherto considered the tissues as taking matter from the blood, changing

the form of it, and giving it back to the blood; but this is far from being the true account of the process. It does indeed represent all that we know of the metabolism of many tissues. In muscle, for example, matters are drawn from the blood, converted to other shapes within the tissue, and sooner or later cast out into the blood-current again. The same may be said of nerve-tissue and possibly of some other tissues. In secreting glands the case is different. Some only of the products of tissue-metabolism are returned to the blood; others are poured into the ducts of the glands as the glandular secretion, and so leave the body altogether. This happens, for example, in the digestive glands, the milk-glands, and the kidneys. In a third order of tissues the case is different again, for here some of the products of metabolism may be retained in the tissue for an indefinite time. This occurs in certain tissues which have been called storage tissues, and of which fat is a typical example. Lastly, the liver is a complex organ whose metabolic products are disposed of in all three ways—part being cast at once into the blood, part being accumulated in the tissue itself as glycogene and passing into the blood at intervals as the body needs it, and a third part being poured into the biliary ducts in order that it may escape into the intestine.

We have hitherto regarded the blood as subordinately related to the great processes of the body, as playing the mechanical part of a carrier, and as if it had no *direct* interest in the metabolic operations themselves; the reader, however, need scarcely be reminded that, but for the respiratory exchanges between the blood on the one hand and the anatomical elements of the tissues on the other, all metabolic processes would be impossible. In the article RESPIRATION, and in treating the particular section “the respiration of the tissues,” the influence of those exchanges on metabolism will be carefully considered.

The older physiologists regarded the blood as the very seat of the chemical changes of the body—a view which is almost entirely opposed to that which we now hold, and which is disproved by many facts.

We have little or no evidence that the blood exhibits transformations of matter such as the tissues generally. There are few such transformations known to us in which carbonic acid is not one of the most abundant end-products of the change, and, therefore, when we find that blood removed from contact with the tissues and freed from carbon dioxide produces very little of this body, although an abundance of oxygen be supplied to it, we have the right to suspect strongly that it is due to the absence of any active metabolism.

The blood is subject to continual additions and subtractions on the part of the tissues. The subtractions effected by the tissues are made good in part by the importation of fresh material of food from the alimentary canal. The analogous counterbalancing operations which serve to check the accumulation of used-up tissue-substance in the blood take place in certain organs called *excretory*. In a strict sense, all organs which cast out material from the body are excretory; the digestive glands, for example, pour their secretions into the alimentary canal, *i.e.*, outside the strict limits of the body. But so much of their constituents are reabsorbed before the alimentary canal is traversed that they may, for practical purposes, be regarded as never having left the body. Even the constituents of tears, when these do not fall over the cheeks or escape at the nose, are reabsorbed from the nasal mucous membrane. With respect to the alimentary secretion, it is merely a small proportion of the bile which remains in the fæces that is to be regarded as truly excretory in the sense of being utterly lost to the

organism. If excreta are those substances which the body rejects utterly, then we may reckon as excreta (1) the urine, (2) the sweat and oily secretions of the skin, (3) the milk, (4) certain elements of bile contained in the feces, (5) the gaseous and watery losses of the lungs, (6) the exuviated horny scales of skin and nails and hair, (7) the products of the generative organs, but not those constituents of feces which are but the undigested remains of food. Among these (if we except the milk and the generative secretions whose elaboration is so peculiar and exceptional) the urine and the excretory products of the lungs and skin are those of paramount importance. The excretion from the lungs will be treated under RESPIRATION; we shall therefore here concern ourselves with the excretion of kidneys and skin.

Urine is a clear, amber-colored fluid, somewhat acid in reaction, with a peculiar aromatic odor and bitter saline taste. Its specific gravity varies, consistently with health, within wide limits, being affected very greatly (*a*) by the quantity of liquid consumed by the individual in a given time, (*b*) by the greater or less activity of the secretion of sweat. While the average specific gravity may be stated to be about 1.020, it is often temporarily much lower and occasionally considerably higher. As a rule the specific gravity is higher in summer than in winter. The average quantity of urine passed by a healthy adult may be reckoned at fifty-two fluid ounces, though it is affected by the same causes as those which influence the specific gravity no less than by individual peculiarity and other circumstances.

The urine is essentially a watery solution of certain organic matters, of which much the most abundant and important is urea, and of mineral salts, of which the most abundant is common salt (sodium chloride).

The urine is excreted continuously in the *kidneys*, two organs situated at the back of the abdominal cavity. The fluid is continuously poured by two ducts called *ureters* into a common reservoir situated in the pelvis, and known as the *urinary bladder*. From this reservoir the urine is intermittently ejected by the *urethra*. The two kidneys never secrete symmetrically; they exhibit an alternation of vascular and secretory activity. Similar variations have been observed in the different portions of one kidney—first one and then another region of the kidney will be found to be in full activity. Nevertheless, when one kidney is extirpated or unfitted for its function, the other may be capable of the whole work of excretion.

The excretory portion of the kidney, like the secretory portion of all glandular organs, consists of tubes of basement membrane lined with cells of peculiar attributes and surrounded by capillaries for blood and lymph, which allow their fluids to come into close communication with the secreting cells. The complex disposition of the tubes, of which there are hundreds in each kidney, has been traced after an infinite amount of patient research. An account of the arrangement of the tubuli uriniferi falls beyond the scope of the present article.

Excretion of Urine.—A review of the constituents of the urine discloses that the function of the kidneys is to separate from the blood chiefly (1) nitrogenous crystalline bodies which are undoubtedly the end-products of the oxidation of nitrogenous bodies, and (2) inorganic salts and water. Ever since the whole course and form of the renal tubules became mapped out, and the existence of a double system of capillaries was established, it has been the habit of physiologists to regard the excretion of urine as a twofold operation. Sir William Bowman, so long ago as 1842, in the course of a histological investigation of the structure of the

kidney, came to the conclusion that the watery portions of the urine are excreted in the capsule, while the solid parts are removed from the blood surrounding the lower parts of the renal tubule.

The second great excretory system is that of the skin, which supplements in important particulars the excretory functions of the kidneys. This function of the skin is effected in great measure by certain glands, called sweat-glands, opening on the surface of the skin. There are, indeed, other glands besides the sweat-glands connected with the skin, viz., the sebaceous glands, which open chiefly into the sacs of hair-follicles and secrete an oily material which keeps the surface of the skin supple and water-tight. The sebaceous secretion resembles in formation the secretion of milk. Inasmuch as it is not reabsorbed, it is a true excretion; but there is reason to believe that the material removed from the blood is elaborated out of complex fat-yielding molecules contained in the blood very much as the milk is secreted. We know very little either of the nature of the bodies excreted or of the processes of their formation. The chief excretory products of the skin are furnished by the sweat-glands, and constitute sweat. In addition, however, there is constantly being thrown off from the skin a certain quantity of carbonic acid.

It is impossible to collect sweat for analysis under perfectly normal conditions; either the body must be subjected to great heat to adduce a copious flow, or a part of the body must be inclosed in an air-tight bag of india-rubber. In both cases the conditions are abnormal. So far as can be ascertained, the sweat is a colorless clear fluid of acid reaction and characteristic odor. The odor varies with the part of the skin from which the sweat is obtained. It consists of water containing 1.81 per cent. of solids. The lungs (looked at as excretory organs), the kidneys, and the skin are all engaged in the great task of ridding the system of its superfluous matters, and each supplements the actions of the others. The lungs are the great excretors of carbonic acid, which is the chief oxidation product of the body, though they share with the kidneys and skin the task of getting rid of water. The kidneys have thrown upon them the task of removing from the system nearly the whole of the nitrogenous waste products and the superabundant salts, besides being the great excretors of water. The skin, on the other hand, looked upon as an excretory organ, is second in importance to the kidneys as a remover of water, and comes next to the lungs in separating carbonic acid. The skin, it must be remembered, however, has many functions besides those of an excretory organ, for, besides being an organ of sense, it takes the chief part in regulating the temperature of the animal body.

The chemical changes which occur in all the tissues and organs of the body are, in the main, processes of oxidation, in which energy that was potential in the organic compounds and the oxygen that takes part in them become in great part kinetic. This energy takes the form of mechanical work and heat; the mechanical work is in part expended within the body itself and ultimately takes the form of heat; in part, however, it is expended upon the objects of the external world, and, though even then ultimately transformed into heat, this is not heat which is available for the purposes of the body. There can be no doubt, however, that a large portion of the total heat evolved in the body is the immediate result of chemical operations, and has not in the first instance taken the form of mechanical work.

The total income and expenditure of energy of an average man in twenty-four hours is calculated to correspond to the amount of heat required to raise 595

pounds of water from the temperature of melting ice to that of boiling water.

Where, it will be asked, does this transformation of energy chiefly have its seat? The answer to this question is that it is firstly in the muscles, then in the glands of the body. At all times, whether in rest or activity, heat is evolved, but the quantity increases in the case both of glands and of muscles as they pass from the former into the latter condition. In the resting body the losses of energy are represented by the loss of heat, for the mechanical work done within it takes the form of heat within the body itself. It is difficult, nay, impossible, to calculate the amount of energy which in the first instance takes the form of mechanical work in the body, and which is always transformed into heat. The case of the heart is one in which, however, an approximate calculation can be made. Upon fairly reliable data it has been calculated that the work expended by the heart of a man in twenty-four hours amounts to not less than 627,768 foot-pounds, an amount of work which is equivalent to nearly forty-five pound-units of heat, and which represents the energy evolved as heat in the complete combustion of about 386 grains of carbon.

Different animals, like steam-engines of different construction, vary in the proportion borne by the external work they are capable of performing to the total energy which becomes kinetic. Experiments made with the separate muscles of animals, no less than observations on the relation between the external mechanical work done by and the total heat evolved in the body of animals, have, however, shown that animals are more economical machines than the most perfect steam-engines. While the latter cannot convert more than one-eighth of their available energy into work, the animal may yield as much as one-fifth of its energy in the form of available external work.

In the adult body in a state of health the income of matter balances as nearly as possible the expenditure, and therefore the weight of the body and its dimensions remain nearly constant, and the same is approximately true of the different organs and tissues which compose the body, as well as of the anatomical elements which enter into their formation. Even when the conditions to which the organism is subjected undergo great variations—as, for instance, when from a state of rest it passes into a state of great activity, or when the temperature of the medium which it inhabits undergoes great changes—and when, to meet these variations in external circumstances, the rate of the exchanges of matter has to undergo great fluctuations, the weight of the body remains nearly constant. This remarkable result is one which doubtless depends upon a great many factors which are for the most part hidden from us.

In the growing body matters are, however, very different; in it normally the income must be always so much in excess of the expenditure that an accumulation of capital may occur and that the body may increase in weight and in dimensions. The growing body is always the seat of a more active exchange of matter than the fully developed body, *i.e.*, weight for weight, it requires more food and oxidizes it more rapidly.

The increase of weight and of dimensions occurs in part by addition of matter to, and increase in weight and in dimensions of, individual organs and their constituent anatomical elements; in part, however, it is due to an actual multiplication of anatomical elements occurring at a rate which greatly exceeds that which occurs in the adult body. To what an extent this multiplication occurs and how it gradually diminishes is evident when we reflect that the whole

organism was originally derived from a single cell, the ovum.

Upon what depends this tendency to multiplication of anatomical elements, and this tendency to increase in size of individual anatomical elements or of organs, until a certain approximate limit has been attained, is absolutely unknown. We know to a certain extent that the process of *growth* depends upon and is influenced by certain circumstances, as amount of food, temperature, blood-supply to the particular organ, and so on, but yet the knowledge is wanting which would tell us why, when a certain limit has been attained, the process of income and expenditure balance and growth ceases.

Scarcely less mysterious than the primary causes of growth is the fact that every organism having arrived at maturity remains in a state of apparent structural and functional integrity for a term which possesses an approximately constant mean value for each species, and then sooner or later necessarily passes into a condition of gradually lessening efficiency, which ultimately terminates in death. Were the animal organism a machine undergoing a constant though very slow process of waste, its decay and ultimately its death would be more obvious than they actually are. The organism, however, differs from the machine in that its matter is continually the seat of change, and that during long periods (*i.e.*, during healthy adult life) the processes of gain and loss of matter appear to be going on with perfect evenness and equality. Why, then, the ultimate deterioration resulting in waste and then in death? The answer is that the organ as a whole unquestionably does suffer by work, and, though at first the degree of impairment is so slow as to be imperceptible, it doubtless is a continuous process.

A general impairment of the mechanism of the body as it passes from the age of mature or adult life into old age is evidenced (1) by a diminished rate in the exchange of matter of the body; (2) by a diminished power manifested by the organism as a whole, as well as by each of its individual organs, to accomplish work; (3) by a general loss of weight of the body and of its essential tissues and organs, though the weight of the body as a whole may increase by the development and storage of fat; (4) by a tendency to structural change of organs or parts of organs whose proper function is essential to life, as, for example, of the circulatory, respiratory, and nervous apparatuses; (5) by a readiness to be injuriously affected by external circumstances, which at an earlier period produce no obvious effect upon the body or only temporary impairment of its functions. The gradual and general deterioration of the organism thus evidenced is usually interrupted by the supervention of some process impairing so greatly the functions of a vital organ that the organism as a whole ceases to perform the functions which characterize it as living, and death results. Whatever the remote cause of death, the proximate cause is in every case an arrest of the circulation of the blood, putting an end to the exchanges of matter and energy which are the most characteristic of the accompaniments of life.

NUTTALL, THOMAS, botanist and ornithologist in the United States, where he lived and worked from 1808 until 1842, was born at Settle, in Yorkshire, in 1786, and spent some years as a journeyman printer in England. Soon after coming to the United States he was induced by Professor Barton to apply himself to the study of the plants; and in pursuance of his investigations he undertook many long and arduous as well as dangerous journeys, usually spending the summers in the field and the winters in working out the materials accumulated during his expeditions. In 1822 he was

appointed curator of the botanic gardens of Harvard University, but continued his explorations, and in 1834 crossed the continent to the Pacific Ocean, and visited the Sandwich Islands. Some property having been left him in England on condition of his residing on it during part of each year, he left America in 1842, and did not again revisit it, except for a short time in 1852. He died at St. Helen's, Lancashire, September 10, 1859.

NUX VOMICA, a poisonous drug, consisting of the seed of *Strychnos Nux-Vomica*, L., a tree indigenous to most parts of India, and found also in Burmah, Siam, Cochin China, and northern Australia. The tree, which belongs to the natural order *Loganiaceae*, is of moderate size, with a short, thick, often crooked stem, and ovate entire leaves, marked with five, six or seven veins radiating from the base of the leaf. The flowers are small, greenish-white, and tubular, and are arranged in terminal corymbs. The fruit is of the size of a small orange, and has a thin, hard shell, inclosing a bitter, gelatinous, white pulp, in which from one to five seeds are vertically imbedded. The seed is disk-shaped, rather less than one inch in diameter, and about one-quarter of an inch in thickness, slightly depressed toward the center, and in some varieties furnished with an acute keel-like ridge at the margin. This is particularly the case with the seeds imported from Bombay and collected in that province. Those imported from Madras and Cochin China have usually a rounded margin. The acute margin is considered in commerce indicative of superior quality, seeds so characterized yielding the largest quantity of the active principles.

The drug owes its poisonous property chiefly to the alkaloids *strychnia* and *brucia*, the mixed alkaloids found in the seed being in the proportion of about 1 per cent. of the former to 2 per cent. of the latter. These alkaloids occur in the seeds in combination with a probably complex body which has been named strychnic or igasuric acid. *Brucia* is distinguished from strychnia by giving a red color when moistened with strong nitric acid, and by being soluble in 150 parts of boiling water, while strychnia requires 2,500 parts for its solution. It is remarkable that although the pulp contains strychnia it is not poisonous to birds, being eaten by the hornbill, *Buceros malabaricus*, and other species. Parasitic plants of the natural order *Loranthaceae*, when growing on *Strychnos Nux-Vomica*, acquire the poisonous properties of the latter.

NYACK, a village of Rockland county, N. Y., twenty-eight miles from New York city. It has manufactures of boots and shoes, boilers, wooden-ware, and other articles, contains a national bank and savings bank, several large summer hotels, six churches, and good schools. Its population (1900) was 4,275.

NYANZA. For Albert Nyanza and Victoria Nyanza, see **NILE**.

NYASSA, LAKE. See **ZAMBESI**.

NYBORG, a town and seaport of Denmark, on the east side of the island of Fünen, 28¼ miles by rail east of Odense, and the point from which the steam-packets cross the Great Belt to Korsör in Zealand. Population, 2,000.

NYIREGYHÁZA, a town of Hungary, in the district of Szabolcs, is situated at the junction of the river Theiss and the railways at the northeast of Hungary, thirty miles to the north of Debreczin. It contains four churches, a gymnasium, and a mineral bath. The inhabitants of the town, who numbered 33,088 in 1900, are engaged in agriculture, wine-growing, and the manufacture of soda, matches, and saltpeter. A little to

the northwest is the famous wine-producing district of Tokay, which yields about 18,000,000 gallons of wine annually, including 3,000,000 or 4,000,000 gallons of genuine Tokay.

NYKÖPING, a city of Sweden, the chief town of the province of Nyköping (Södermanland), is situated on both banks of a stream which unites Lakes Yngaren, Tisaren, etc., with By Fjord, and so with the Baltic. Connected by a branch line with the railway from Stockholm to the Norwegian frontier, it lies about 100 miles by rail southwest of Stockholm. Population, 5,000.

NYLGHAU, or **NIL-GAI**, one of the largest of the antelopes, a handsome and graceful animal, with short, straight, erect horns, pointed and turned slightly forward at the tips, and present in the male only. It has a short erect mane, and the male has also a tuft of hair on the throat. When adult the sexes are very different in color, the male being generally of a dark iron-gray or slate color, approaching black on the head and legs, while the female and young are of a bright light-brown or fawn color. In both male and female at all ages, the lips, chin, and under-parts as well as two transverse stripes on the inner sides of the ears and rings on the fetlocks are white, and the mane and tip of the tail black. The horns are black, and from eight to nine inches long. The male stands about four feet four inches high at the shoulder, the female is smaller. The tail is eighteen to twenty-one inches in length.

The Nylghau is one of the few true antelopes occurring in India, and is peculiar to that country, being found from near the foot of the Himalayas to the south of Mysore, though rare to the north of the Ganges and also in the extreme south. It is most abundant in central India, and does not occur in Assam or the countries to the east of the Bay of Bengal.

NYMPH. The belief that the nature which surrounds mankind—the woods, the springs, the hills—is full of a life resembling, yet different from, human life, is universal in a primitive stage of thought. At Psophis in Arcadia a row of tall cypress-trees was called the damsels. There is a close relation between the souls of dead men and the life of nature; the Nymphs often play the part of death and carry away human beings to dwell with them. This idea appears in a slightly different form when heroes and favored mortals live in communion with them. The connection of a human being with a Nymph has something unnatural about it, and almost always brings some disaster on the mortal. He whose mind the Nymphs take possession of loses his human wit and becomes mad, but has wisdom more than human. The worship of the Nymphs was practiced throughout the classical period in places where they seemed to have chosen a home for themselves, in shady groves and beside springs of clear water. It retained its native simplicity. No temple, no statue, no priest was needed; the offerings of a rural people were placed on the simple altar. The cultus is, therefore, not often mentioned in literature; but it appears to have been closely connected with the household life of the people, and to have had a strong hold on them. Among the ceremonies of marriage an acknowledgment of the power of the Nymphs was included. The bride, herself a *Nymphe*, was sprinkled with water from the fresh spring of the Nymphs, or she went to bathe in the spring. The Nymphs, the ever-youthful spirits of nature, protected and nourished children; they were themselves often, especially in Asia Minor, the mothers of the heroes of the land.

O.

O. The history of the symbol O is parallel to that of E. Each represents several sounds which are distinguished habitually in speech without any difficulty, but for which, owing to the imperfection of the English alphabet, there are no separate symbols. Probably the confusion is worst in English; but French and Italian also have more sounds for each of these symbols than can be properly included under them, and so they distinguish these sometimes by diacritical marks, as *ô* or *ô*, and sometimes they do not distinguish at all.

The different sounds which *o* is used to denote in English lie, with one exception, on the line between the pure *a*-sound and the pure *u*-sound. We have already seen that *e* denotes several different sounds on the other line—that between pure *a* and pure *i*. The difference between the sounds on these two lines is this. In the *a*—*i* line only the tongue is employed; it is raised more and more for each successive sound. But in the *a*—*u* line the tongue is not the only agent; the cavity of the mouth is also contracted, so that the passage is narrowed, and the lip-aperture is lessened more and more for each sound; in technical phrase the lips are “rounded,” so that for *u* the aperture is the smallest possible to allow of the utterance of a true vowel, hence the great ease with which the *u*-sound passes into a *w*, in which there is friction caused by the still greater closing of the lips, and therefore we have a consonant, not a vowel, sound.

The following different sounds—denoted by O in English—are readily discriminated. Beginning from the *a*-end of the line, we come first to the sounds heard in “not” and in “lord;” for both of these the back of the tongue is much depressed and the lips are only slightly rounded. The difference between the two sounds consists in this—for the first the back of the tongue is more convex than for the second; the passage is therefore somewhat narrowed, and the two corresponding sounds are therefore (here and in all other similar pairs) known technically as “narrow” and “wide,” or as “open” and “close.” The narrow sound is written by *o* in English when *r* or *l* follows, and the wide is written *aw* as in “law,” or *au* as in “Paul,” or even *a* as in “pall.” The next pair may be exemplified by “pole” and “pour,” narrow and wide respectively; for these the tongue is higher and the rounding greater. Here again several digraphs represent the same sound, as in “foal,” “soul,” “hoe,” “grow.” Next the doubled *o* is generally used to represent the last sound in the scale, the close *u*, for which the tongue is highest and the “rounding” greatest, as in “pool;” but in “rule” and others the same symbol is used for this sound as would be used in other European languages. Lastly—the exception mentioned above—*o* is one of the symbols employed to denote the neutral vowel, as in “son,” as well as *u* in “sun” and *a* in “final.”

CAJACA, or OAXACA, the chief town of the province of the same name in Mexico, lies 1,600 feet above the sea in a beautiful valley on the left bank of the Ato-

yac, or Rio Verde, which reaches the Pacific after a course of about 170 miles. The city is surrounded by luxuriant gardens, orchards, and cochineal plantations; its streets are wide and regular, and among its public buildings are the cathedral, the bishop's palace (fashioned after the type of a similar ancient edifice at Mitla), and the Dominican monastery and church. Chocolate, cigars, cotton cloth, wax candles, etc., are manufactured. Population (1896), 32,437. The city, which dates from 1522, was visited by a severe earthquake in 1870.

OAK, a word found, variously modified, in all Germanic languages, and applied to plants of the genus *Quercus*, a well-marked section of the natural order *Corylaceæ* (*Cupuliferæ* of De Candolle), including some of the most important timber-trees of the north temperate zone. All the species are arborescent or shrubby, varying in size from the most stately of forest trees to the dwarfish bush. Monœcious, and bearing their male flowers in catkins, they are readily distinguished from the rest of the Cupuliferous family by their peculiar fruit, an acorn or nut, inclosed at the base in a woody cup, formed by the consolidation of numerous involucre bracts developed beneath the fertile flower, simultaneously with a cup-like expansion of the thalamus, to which the bracteal scales are more or less adherent. The ovary, three-celled at first, but becoming one-celled and one-seeded by abortion, is closely invested by the perianth, toothed on the margin, and adherent below; the male flowers are in small clusters on the usually slender and pendent stalk, forming an interrupted catkin; the stamens vary from six to twelve. The alternate leaves are more or less deeply sinuated or cut in most of the species, but in some of the deciduous and many of the evergreen kinds are nearly or quite entire on the margin. The oaks are widely distributed over the temperate parts of Europe, Asia, North Africa, and North America. In the western hemisphere they range along the Mexican highlands and the Andes far into the tropics, while in the Old World the genus, well represented in the Himalayas and the hills of China, exists likewise in the peninsula of Malacca, in Java, and in some other islands of the archipelago, several species occurring in the Moluccas and Borneo. On the mountains of Europe and North America they grow only at moderate elevations, and none approach the arctic circle. The multitude of species and the many intermediate forms render their exact limitation difficult, but those presenting sufficient marked characteristics to justify specific rank probably approach 300 in number.

The well-known *Q. Robur*, one of the most valued of the genus, and the most celebrated in history and myth, may be taken as a type of the oaks with sinuated leaves. Though known in England, where it is the only indigenous species, as the British oak, it is a native of most of the milder parts of Europe, extending from the shores of the Atlantic to the Ural; its most northern limit is attained in Norway, where it is found wild up to latitude 63°, and near the Lindesnæs forms woods of some

extent, the trees occasionally acquiring a considerable size. In western Russia it flourishes in latitude 60°, but on the slope of the Ural the 56th parallel is about its utmost range. Its northern limit nearly coincides with that of successful wheat cultivation. Southward it extends to Sardinia, Sicily, and the Morea. In Asia it is found on the Caucasus, but does not pass the Ural ridge into Siberia. In Britain and in most of the Continental habitats two varieties exist, regarded by many as distinct species: one, *Q. pedunculata*, has the acorns, generally two or more together, on long stalks, and the leaves nearly sessile; while in the other, *Q. sessiflora*, the fruit is with or without a very short peduncle, and the leaves are furnished with well-developed petioles. The British oak is one of the largest trees of the genus, though old specimens are often more remarkable for the great size of the trunk and main boughs than for very lofty growth. The spreading branches have a tendency to assume a tortuous form, owing to the central shoots becoming abortive, and the growth thus being continued laterally, causing a zigzag development, more exaggerated in old trees and those standing in exposed situations; to this peculiarity the picturesque aspect of ancient oaks is largely due.

Vast oak forests still covered the greater part of England and central Europe in the earlier historic period; and, though they have been gradually cleared in the progress of cultivation, oak is yet the prevailing tree in most of the woods of France, Germany, and southern Russia, while in England the coppices and the few fragments of natural forest yet left are mainly composed of this species. The great regard paid to the oak probably originated in the value attached to its timber and fruit; the largest and most durable of European trees, its wood was looked upon as the most precious produce of the forest. With both Greek and Roman it was the favorite timber for house, bridge and ship building; and the furrowed columns with spreading base that upheld their stone-built temples of historic age seem to indicate the oak-trunk as their archaic prototype. The tree was not in less esteem among the Teutonic nations; the long ships of the Northmen were hewn from the same "heart of oak" of which the warships of England were until lately constructed. The oak of Britain is still in great demand for the construction of merchant shipping, though teak has become in some measure its substitute, and foreign oak of various quality and origin largely takes its place. Its great abundance of curved trunks and boughs rendered the oak peculiarly valuable to the shipwright when the process of bending timber artificially was less understood; the curved pieces are still useful for knees. The younger oaks are employed by the carpenter, wheelwright, wagon-builder, and for innumerable purposes by the country artisan. The most durable of fences are those formed of small oaks, split lengthwise by the wedge into thin boards. The finely-grained heart-wood is sought by the cabinetmaker for the manufacture of furniture, and high prices are often given for the gnarled and knotted portions of slowly-grown trees, to be sawn into veneers. Oak was formerly largely used by wood-carvers, and is still in some demand for those artists, being harder and more durable than lime and other woods that yield more readily to the sculptor's tool. The wood, of unknown age, found submerged in peat-bogs, and of a black hue, is largely used in decorative art under the name of "bog-oak."

The oak grows most luxuriantly on deep, strong clays, calcareous marl, or stiff loam, but will flourish in nearly any deep, well-drained soil, excepting peat or loose sand; in marshy or moist places the tree may grow well for a time, but the timber is rarely sound; on hard, rocky

ground and exposed hillsides the growth is extremely slow and the trees small, but the wood is generally very hard and durable. The tree will continue to form wood for 150 to 200 years before showing any symptoms of decay. As firewood oak holds a high position, though in Germany it is considered inferior to beech for that purpose. It makes excellent charcoal, especially for metallurgic processes; the Sussex iron, formerly regarded as the best produced in Britain, was smelted with oak charcoal from the great woods of the adjacent Weald, until they became so thinned that the precious fuel was no longer obtainable.

An important product of oak woods is the bark, that from a remote period has been the chief tanning material of Europe. The most valuable kind is that obtained from young trees of twenty to thirty years' growth, but the trunks and boughs of timber-trees also furnish a large supply; it is separated from the tree most easily when the sap is rising in the spring. It is then carefully dried by the free action of the air, and when dry built into long, narrow stacks until needed for use. The value of oak bark depends upon the amount of tannin contained in it, which varies much, depending not only on the growth of the tree, but on the care bestowed on the preparation of the bark itself, as it soon ferments and spoils by exposure to wet, while too much sun-heat is injurious.

The acorns of the oak possess a considerable economic importance as food for swine. In the Saxon period the "mast" seems to have been regarded as the most valuable produce of an oak wood; nor was its use always confined to the support of the herds, for in time of dearth acorns were boiled and eaten by the poor as a substitute for bread in both England and France, as the sweeter produce of *Q. Esculus* is still employed in southern Europe. Large herds of swine in all the great oak woods of Germany depend for their autumn maintenance on acorns.

The oak grows well in the northern and middle United States; and, from the superiority of the wood to that of *Q. alba* and its more abundant production of acorns, it will probably be much planted as the natural forests are destroyed. The young trees require protection from storms and late frosts even more than in England; the red pine of the northeastern States, *Pinus resinosa*, answers well as a nurse, but the pitch pine and other species may be employed. In the southern parts of Australia and in New Zealand the tree seems to flourish as well as in its native home.

In North America, where the species of oak are very numerous, the most important member of the group is *Q. alba*, the white oak, abounding all over the eastern districts of the continent from Lake Winnipeg and the St. Lawrence countries to the shores of the Mexican Gulf. In aspect it more nearly resembles *Q. Robur* than any other species; forming a thick trunk with spreading base and, when growing in glades or other open places, huge spreading boughs, less twisted and gnarled than those of the English oak and covered with a whitish bark that gives a marked character to the tree. The leaves are large, often irregular in form, usually with a few deep lobes dilated at the end; they are of a bright, light green on the upper surface, but whitish beneath; they turn to a violet tint in autumn. The egg-shaped acorns are placed singly or two together on short stalks; they are in most years sparingly produced, but are occasionally borne in some abundance. On rich loams and the alluvial soils of river-valleys, when well drained, the tree attains a large size, often rivaling the giant oaks of Europe; trunks of three or four feet in diameter are frequently found, and sometimes these dimensions are greatly exceeded. The wood

is variable in quality and, though hard in texture, is less durable than the best oak of British growth; the heart-wood is of a light, reddish-brown varying to an olive tint; a Canadian specimen weighs fifty-two and one-quarter pounds the cubic foot. In the United States it is largely used in shipbuilding, for house timber, and many other purposes; wheels and the frames of wagons and sleighs as well as casks are often made of it; large quantities are exported to England from Canada. The young wood is very strong, flexible, and elastic; it is split into thin strips, to be made into baskets. The large roots, often presenting a very fine grain and taking a good polish, are sought for by the cabinet-maker. The bark is inferior to that of many oaks.

Q. obtusiloba, the post oak of the backwoodsman, a smaller tree with rough leaves and notched upper lobes, produces an abundance of acorns and good timber, said to be more durable than that of the white oak.

The pin oak, sometimes called the "over-cup" oak, *Q. macrocarpa*, is remarkable for its large acorns, the cups bordered on the edge by a fringe of long, narrow scales; the leaves are very large, sometimes from ten inches to a foot in length, with very deep lobes at the lower part, but dilated widely at the apex, and there notched. The tree is not of large growth, but its tough wood is useful for bolts and trenails; it is sometimes called the "burr-oak."

The true over-cup oak, *Q. lyrata*, is a large tree, chiefly found on swampy land in the southern States; the lyrate leaves are dilated at the end; the globose acorns are nearly covered by the tuberculated cups.

In the woods of Oregon, from the Columbia river southward, an oak is found bearing some resemblance to the British oak, in foliage and in its thick trunk and widely spreading boughs, but the bark is white as in *Q. alba*; it is *Q. Garryana*, the western oak of Nuttall. This tree acquires large dimensions, the trunk being often from four to six feet in diameter; the wood appears to be good, but experience has scarcely tested its durability; the acorns are produced in great quantity, and are used by the Indians as food.

The red oak, *Q. rubra*, has thin large leaves on long petioles, the lobes very long and acute, the points almost bristly; they are pink when they first expand in spring, but become a bright glossy green when full grown; in autumn they change to the deep purple-red which gives the tree its name. Common throughout the northern and middle States and Canada, the red oak attains a large size only on good soils; the wood is of little value, being coarse and porous, but it is largely used for cask-staves; the bark is a valuable tanning material.

A species nearly allied is the scarlet oak, *Q. coccinea*, often confounded with the red oak, but with larger leaves, with long lobes ending in several acute points; they change to a brilliant scarlet with the first October frosts, giving one of the most striking of the various glowing tints that render the American forests so beautiful in autumn. The trunk, though often of considerable size, yields but an indifferent wood, employed for similar purposes to that of *Q. rubra*; the bark is one of the best tanning materials of the country. Both these oaks grow well in British plantations, where their bright autumn foliage, though seldom so decided in tint as in their native woods, gives them a certain picturesque value.

The chestnut oaks of America represent a section distinguished by the merely serrated leaves, with parallel veins running to the end of the serratures. *Q. Prinus*, a beautiful tree of large growth, and its sub-species *Q. castanea* and *Q. montana*, yield timber little inferior to white oak. *Q. Chinquapin* or *prinoides*, a dwarf

variety, often only a foot in height, forms dense miniature thickets on the barren uplands of Kansas and Missouri, and affords abundant sweet acorns; the tree is called by the hunters of the plains the "shin-oak."

Evergreen oaks with entire leaves are represented in North America by *Q. virens*, the live oak of the southern States; more or less abundant on the Atlantic coasts of Carolina and Florida, its true home is the country around the Mexican Gulf, where it rarely grows more than fifty or sixty miles inland. The oval leaves are dark green above, and whitish with stellate hairs beneath, the margin entire and slightly recurved. The live oak is one of the most valuable timber-trees of the genus, the wood being extremely durable, both exposed to air and under water; heavy and close-grained, it is perhaps the best of the American oaks for shipbuilding, and is invaluable for water-wheels and millwork. Live oaks grow but slowly, and few large trees are left in the settled districts; but when standing in open places the trunk sometimes attains a great size, and an old tree, with its far-spreading boughs, often clothed with the beard-like "Spanish moss," has a peculiarly venerable aspect. One growing at Grove Creek, near Charleston is said to have attained a girth of forty-five feet at the ground; trees of twelve feet in circumference were formerly not infrequent. The stalked oblong acorns in elongated cups are pleasant in taste, and were eaten by the Indians of Texas.

In America several oaks exist with narrow lanceolate leaves, from which characteristic they are known as "willow oaks." *Q. Phellos*, a rather large tree found on swampy land in the southern States, is the most important of this group; its timber is of indifferent quality.

The cork oak, *Q. Suber*, has been described in a preceding article (CORK). In Spain the wood is of some value, being hard and close-grained, and the inner bark is used for tanning. From its rugged silvery bark and dark-green foliage, it is a handsome tree.

OAKAPPLE, or OAKGALL. See GALLS.

OAKLAND, a city in Alameda county, Cal., lies opposite San Francisco, of which it is practically a residential suburb, on the eastern shore of San Francisco Bay, at the terminus of the Central Pacific Railroad. Its beautiful situation, its shady streets, and the excellent quality of its buildings make it a distinctly attractive place. A branch of the bay, dividing the city into East and West Oakland, forms a good harbor, but is obstructed by a bar. The railway pier, two miles long contains a number of warehouses and is traversed by a broad carriage road. Among the local industrial establishments are flour-mills, planing-mills, potteries, tanneries, and a jute-factory. Oakland, deriving its name from a grove of oaks in the midst of which it was built, was incorporated in 1854. The city's bonded debt (1901) was \$405,000; its valuation for assessment, \$44,224,168, rate of taxation, \$1.17; total annual expenditures, \$714,713. Population was 66,960 in 1900.

OAKUM is a preparation of tarred fiber used in shipbuilding, for calking or packing joints of timbers in wood vessels and the deck planking of iron and steel ships. Oakum is made by preference from old tarry ropes and cordage of vessels, its teasing and preparation being a common penal occupation in prisons.

OAMARU, a municipal borough on the coast of Otago, New Zealand (South Island), seventy-three miles by rail north from Dunedin, is a thriving seaport. It is the outlet of the largest agricultural district in New Zealand. It is on the main railway between Christchurch and Dunedin, and is connected by branch lines with fertile inland districts. A breakwater and mole,

constructed of blocks of concrete like those used at Port Said in Egypt, inclose a large and commodious basin in what was an open roadstead; and the harbor is one of the safest in the colony, and capable of accommodating very large ships. Population, 8,000.

OAR-FISH, a fish of the family of ribbon-fishes (*Trachypteridae*), to which great interest is attached no less on account of the extraordinary shape of its body than of its internal organization, which is unmistakably that of a deep-sea fish. As in the other members of this family, the body is much elongated and compressed, sword-shaped; but in the oar-fish this character is excessive, the length of the body being about fifteen times its depth. The head likewise is compressed, short, resembling in its form that of a herring; the eye is large, the mouth is small, and provided with very feeble teeth. A long many-rayed dorsal fin, of which the very long anterior rays form a kind of high crest, extends from the top of the head to the end of the tail; the anal and perhaps the caudal fins are absent; but the ventrals (and by this the oar-fish is distinguished from the other ribbon-fishes) are developed into a pair of long filaments, which terminate in a paddle-shaped extremity, but are too flexible to assist in locomotion. The whole body is covered with a layer of silvery epidermoid substance, which easily comes off and adheres to other objects.

Oar-fishes are the largest deep-sea fishes known, the majority of the specimens observed measuring twelve feet in length; but some are recorded to have exceeded twenty feet. Their range in the great depths of the ocean seems to extend over all seas, from the North Sea to the South Atlantic, from Mauritius and Japan to the coast of New Zealand.

OASES. Throughout the great belt of desert extending from the west coast of Africa to central Asia, various fertile tracts occur, clothed with vegetation and watered by springs, to which the name oases has been applied. Those which are best known are met with in the central and eastern portions of the Great Sahara and in the Libyan Desert. In that region they consist generally of deep depressions or valleys, locally termed "wâdis," where the water comes to the surface in natural springs, or where it may be procured by sinking wells. Under the influence of these beneficent springs vegetation bursts forth and covers a more or less extensive area, which becomes a halting place for travelers in the desert, and frequently supports a considerable population. Many of the oases are situated in the mountainous regions, where the ground is sufficiently elevated to precipitate the moisture in the atmosphere. The rain which falls, however, is rapidly absorbed by the rocks or sandy soil, and much of it collects in depressions at no great depth from the surface. The Arabs have long been in the habit of tapping these subterranean waters by sinking wells, a copious supply being usually obtained at depths varying down to 200 fathoms. In the Algerian Sahara a large number of artesian wells have been sunk by the French, resulting in the formation of oases, which have to some extent affected the habits of the native tribes by inducing them to become cultivators of these fertile tracts. It is evident, therefore, that, notwithstanding the arid climate which prevails generally throughout the African deserts, a tolerably plentiful supply of water can be obtained by artificial means at various points. The springs, being essential to the very existence of the oases, are naturally guarded with care so as to prevent the sands encroaching on them. Should they cease to flow, the decay of the vegetation rapidly ensues and the oases disappear.

OAT, *Avena sativa*, L., one of about forty species

mostly dispersed through the temperate regions of the Old World. The spikelets form a loose panicle, familiar in the cultivated oat, the flowering glume having its dorsal rib prolonged into an awn, which is in some species twisted and bent near the base.

Besides the use of the straw when cut up and mixed with other food for fodder, the oat grain constitutes an important food for both man and beast. Being cultivated best in comparatively low temperatures, it has long formed the staple food for Scotland, north England, and Derbyshire, as well as for Germany, wherever wheat does not flourish. It is extensively grown in all the northern States of the American Union, and in New England its production largely exceeds that of wheat. Oatmeal is made from the kiln-dried grain from which the husks have been removed; and the form of the food is the well-known "porridge." In Ireland it is mixed with Indian-corn meal and is called "stirabout." Groats or grits are the whole kernel from which the husk is removed. Their use is for gruel, which used to be consumed as an ordinary drink in the seventeenth century at the coffee-houses in London. The meal can be baked into "cake" or biscuit, as the Passover-cake of the Jews; but it cannot be made into loaves in consequence of the great difficulty in rupturing the starch grains, unless the temperature be raised to a considerable height. With regard to the nutritive value of oatmeal, as compared with that of wheat flour, it contains a higher percentage of albuminoids than any other grain, viz., 12.6—that of wheat being 10.8—and less of starch, 58.4, against 66.3 in wheat. It has rather more sugar, viz., 5.4—wheat having 4.2—and a good deal more fat, viz., 5.6, as against 2.0 in flour. Lastly, salts amount to 3.0 per cent. in oat, but are only 1.7 in wheat. Its nutritive value, therefore, is higher than that of ordinary seconds flour.

OATES, **TITUS**, author of what is known as the "Popish Plot," was born in 1650, the son of an Anabaptist preacher. He took Anglican orders upon leaving the university and officiated in several parishes, but his career was of a character so scandalous and vicious that he was dismissed from the various livings to which he in turn succeeded. Pretending to become a convert to the Roman Catholic faith, he was received into the church and entered the Jesuit College at Valladolid as Brother Ambrose. He was expelled from this institution in 1677, but in October of the same year was admitted to St. Omer, whence he was also expelled.

In June, 1678, by inventing treasonable letters and accounts of preparations for military action, he succeeded in convincing the English people that the pope and the Jesuits were conspiring to massacre the leading Protestants, including Charles II., obtain forcible possession of the kingdom, and establish the Catholic religion. These startling revelations were generally accepted as fact and caused a very pronounced sensation, followed by the execution of many Jesuits and Roman Catholics, for complicity. In October, 1678, Oates, upon being called before the House of Commons, accused the queen before Charles of high-treason, but when the Lords refused to concur with the House, which had voted for the queen's removal from court, the matter was dropped. In 1679 Sir George Wakeman, the queen's physician, was accused of purposing to poison the king, and the queen was named as being concerned in the plot. Wakeman was acquitted of the charge, however, and Oates was proved to have perjured himself in open court. On June 26, 1680, upon Oates' testimony, the duke of York was presented at Westminster as a recusant, and in November the informer gave evidence in the trial of Strafford. The importance of Oates after this rapidly declined, so much

so, that subsequent to the dissolution of 1682, he was no more heard of during Charles' reign, but enjoyed his pension of \$3,000 or \$4,000 in quiet. Prior to the death of Charles, the duke of York recovered \$500,000 damages in a civil action against Oates. While in prison in default of payment of the same, Oates was indicted for perjury, his trial occurring in May, 1685, soon after the accession of James. He was convicted, severely whipped, pilloried, his ears cut off, and imprisoned. He was detained in prison from 1685 to 1689, gaining his liberty upon the flight of James during the latter year. His sentence was afterward annulled, and the matter finally settled by Oates receiving a royal pardon, with a salary of \$1,500 a year. In 1691 he became acquainted with William Fuller, whom he induced to forge another plot. It met with no success, however, and thereafter Oates appears to have lived in retirement. He died July 13, 1705.

OATH. Anglo-Saxon *adth*, a word found throughout the Teutonic languages, but without ascertainable etymology. The verb to *swear* is also Old Teutonic; this word, too, is not clear in original meaning, but is in some way connected with the notion of answering—indeed it still forms part of the word *answer*, Anglo-Saxon *and-swearian*; it has been suggested that the swearer answered by word or gesture to a solemn formula or act.

An oath may be defined as an asseveration or promise made under non-human penalty or sanction. Writers, viewing the subject among civilized nations only, have sometimes defined the oath as an appeal to a deity. The prevalence of the river-worship is seen in the extent to which in the old and modern world oaths by rivers are most sacred. The natural transition from swearing by these great objects of nature to invoking gods conceived in human form is well shown in the treaty-oath between the Macedonians and the Carthaginians recorded by Polybius; here the sun and moon and earth, the rivers and meadows and waters, are invoked side by side with Zeus and Hera and Apollo, and the gods of the Carthaginians. The heaven-god, able to smite the perjurer with his lightning, was invoked by the Romans. As a general rule, however, the supernatural retribution on perjury has been transferred from the present world to the regions beyond the grave, as is evident from any collection of customary oaths.

The forms of oath belonging to all nations and ages, various as they are in detail, come under a few general heads. The Hebrew practice of putting the hand under another's thigh is usually reckoned among oath-rites. Even the covenant among many ancient and modern nations by the parties mixing their blood or drinking one another's is in itself only a solemn rite of union, not an oath proper. Oaths by weapons lasted into the Christian period. Stretching forth the hand toward the object or deity sworn by is a natural gesture. Agamemnon, with uplifted hands, takes Heaven to witness with Sun and Earth and the Erinnyes who below the earth wreak vengeance on the perjurer. The gesture of lifting the hand toward heaven was also an Israelite form of oath. The gesture established itself in Christendom, and has continued to modern times. In England, for example, in the parliament at Shrewsbury in 1398, when the Lords took an oath on the cross at Canterbury never to suffer the transactions of that parliament to be changed, the members of the Commons held up their hands to signify their taking upon themselves the same oath. In France a juror takes oath by raising his hand, saying, "Je jure!" The Scottish judicial oath is taken by the witness holding up his right hand uncovered, and repeating after the

usher, "I swear by Almighty God, and as I shall answer to God at the great day of judgment, that I will," etc. In the ancient world sacrifice often formed part of the ceremony of the oath; typical examples may be found in the Homeric poems, as in Agamemnon's oath already mentioned, or the compact between the Greeks and Trojans, where wine is poured out in libation, with prayer to Zeus and the immortal gods that the perjurer's brains shall, like the wine, be poured on the ground; that the rite thus passes into a symbolic curse-oath of the ordinary barbaric type. Connected with such sacrificial oaths is the practice of laying the hand on the victim or the altar, or touching the image of the god.

The history of oaths in the early Christian ages opens a controversy which to this day has not been closed. Under Christ's injunction, "Swear not at all," many Christians seem at first to have shrunk from taking oaths, and, though after a time the usual customs of judicial and even colloquial oaths came to prevail among them, the writings of the Fathers show efforts to resist the practice. Chrysostom perhaps goes farthest in inveighing against this "snare of Satan." The line mostly taken by influential teachers, however, was that swearing should indeed be avoided as much as possible from its leading to perjury, but that the passages forbidding it only applied to superfluous or trifling oaths, or those sworn by created objects, such as heaven or earth or one's own head. On the other hand, they argued that judicial and other serious swearing could not have been forbidden, seeing that Paul in his epistles repeatedly introduces oaths. This argument is the more forcible from Paul's expressions being actually oaths in accepted forms, and it has also been fairly adduced that Christ, by answering to the adjuration of the high priest, took the judicial oath in solemn form. Among the curiosities of the subject are quaint oaths of kings and other great personages; William Rufus swore "by that and that," William the Conqueror "by the splendor of God," John "by God's teeth;" other phrases are given in Ducange, as "per omnes gentes," "per coronam," "par la sainte figure de Dieu," "par la mort Dieu," etc.

Profane swearing, the trifling or colloquial use of sacred oaths, is not without historical interest, formulas used being apt to keep up traces of old manners and extinct religions. Thus the early Christians were reproved for continuing to say "*mehercle!*" some of them not knowing that they were swearing by Hercules. Oaths by deities of pre-Christian Europe lasted into the modern world, as when a few generations ago Swedish peasants might be heard to swear, "Odin take me if it is not true!" The thunder-god holds his place still in vulgar German exclamations, such as "Donner!" The affected revival of classical deities in Italy in the Middle Ages still lingers in such forms as "per Bacco!" "cospetto di Bacco!" (by Bacchus! face of Bacchus!) In France the concluding oath of the last paragraph has dwindled into "mordieu!" or "morbieu!" much as in England the old oaths by God's body and wounds became converted into "oddsbodikins!" and "zounds!"

The oaths now administered among civilized nations are chiefly intended for maintaining governments and securing the performance of public business. They fall under the headings of political, ecclesiastical, and legal.

OBADIAH is a name pretty frequent in the Old Testament, meaning "servant" or "worshiper" of Jehovah. It is synonymous with Abdi and Abdeel, and of a type common in Semitic proper names. The name of Obadiah is prefixed to the fourth and shortest book of the minor prophets, and as no date or other

historical note is added it is not surprising that an early Hebrew tradition recorded by Jerome identified the prophet with the best known Obadiah of the historical books, the protector of the prophets in the reign of Ahab. His tomb was shown in Samaria with those of Elisha and John the Baptist, and the *Epitaphium Paula* describes the wild performances, analogous to those of modern dervishes, that took place before these shrines.

OBAN, a seaport town and parliamentary burgh of the Western Highlands of Scotland, is situated in Argyllshire. Population about 4,000.

OBELISK. See ALEXANDRIA, ARCHITECTURE, and EGYPT. The obelisk known as "Cleopatra's Needle," having been offered to the English Government by Mehemet Ali, but declined, was brought to London, and placed on the Thames Embankment in 1878. A similar one was conveyed to the United States and erected in Central Park, New York, in 1880.

OBERRAMMERGAU, a small village in the mountain valley of the Ammer, in Upper Bavaria, lies 2,760 feet above the sea, and about 45 miles to the southwest of Munich. In 1900 it contained 1,549 inhabitants, who were mainly engaged in making toys and in carving crucifixes, images of saints, and rosaries. Many of the houses are adorned with quaint frescoes of Biblical subjects. The interest of Oberammergau to the outer world is derived from the Passion Plays which are performed here by the villagers at intervals of ten years (the last in 1890), and are now attended by many thousands of European and American visitors.

OBERRHAUSEN, a Prussian town of recent origin, in the province of the Rhine, is situated five miles from the east bank of that river and twenty miles to the north of Düsseldorf. Its importance is due to the fact of its being one of the busiest railway junctions in Germany, and to the extensive coal-pits in the vicinity. The town also possesses ironworks, rolling-mills, zinc smelting-works, railway workshops, and manufactures of wire rope, glass, porcelain, and soap. The annual export of coals is estimated at about 700,000 tons. The first houses of Oberhausen were built in 1845, and it received its municipal charter in 1875. It contains 16,680 inhabitants, of whom 12,079 are Roman Catholics.

OBERLIN, a village in Lorain county, Ohio, thirty-five miles west-southwest of Cleveland by the Lake Shore and Michigan Southern Railway, has a population of 4,082, and is well known as the seat of Oberlin College. This institution for liberal education, open to all irrespective of sex or color, was founded in 1833 by the Rev. John J. Shipperd and Philo P. Stewart, and named in honor of J. F. Oberlin. In 1902 nine distinct buildings were occupied by the various sections; the total number of teachers was 84 and of pupils 1,357 (648 males, 709 females; 78 colored), and the library contained 63,000 volumes.

OBERLIN, JEAN FREDERIC, pastor and philanthropist, was the son of a teacher, and was born August 31, 1740, at Strasburg, where he studied theology. In 1766 he became Protestant pastor of Waldbach, a remote and poverty-stricken region in the Steinthal (Ban de la Roche), in Alsace. He died June 1, 1826, and was interred with great manifestations of honor and affection at the village of Fouday. Since his death the Steinthal has suffered no interruption to its prosperity. When he began his labors its inhabitants did not number more than 500; in the beginning of the century they had increased to about 3,000; and now they are supposed to number about 6,000.

OBERLIN, JÉRÉMIE, archaeologist, brother of Jean Frédéric Oberlin noticed above, was born at Strasburg, August 8, 1735, and died in 1806.

OBERON (Auberon, Alberon), king of the fairies, husband of Titania, first appears in literature as protector of the hero in *Huon de Bordeaux*, a *chanson de geste*, dating from about the twelfth century. The name corresponds to the German Alberich or Elferich (elf-king). The fairy element in the legend of Huon has been treated in modern times by Wieland in the poem, and by Weber in the opera of *Oberon*; and the story of the elf-king's quarrel with Titania, as everyone knows, supplies an important *motif* in Shakespeare's *Midsummer Night's Dream*.

OBESITY. See CORPULENCE.

OBI. See SIBERIA.

OBLIGATION, in law, is a term derived from the Roman law, in which *obligatio* signified a tie of law (*vinculum juris*) whereby one person is bound to perform or forbear some act for another. The *obligatio* of Roman law arose either from voluntary acts or from circumstances to which legal consequences were annexed.

The term obligation is important in America from its use in Art. i., S. 10 of the constitution of the United States, "No State shall pass any law * * * impairing the obligation of contracts." This does not affect the power of Congress to pass such a law. Contracts between private individuals are of course within the provision. So are private conveyances, charters of private corporations, and statutory and other grants by a State. On the other hand, marriage and divorce, and arrangements which are political in their nature, such as charters of municipal corporations, licenses to carry on particular trades, or regulations of police, are not within the provision. In order to fall within it, the law must act upon the terms of the agreement, and not merely upon the mode of procedure. If it act not upon the terms but upon the remedy, it impairs the obligation if it purport to be retrospective, but it is valid so far as it applies to subsequent contracts.

OBOE, or HAUTOBOY. The oboe is an instrument containing a conical column of air, which is set in vibration by means of a double-tongued reed. A series of holes pierced in the side of the pipe permits the instrumentalist to progressively shorten the column by the successive opening of the lateral holes, and thus produce a series of fundamental sounds, the scale of which, in the primitive instruments without keys, does not exceed the extent of an octave. All instruments with a conical column of air, whatever may be the mode by which that is set in motion, are subject to the laws of vibration of open pipes, according to which, by a stronger pressure in blowing, the oboe reproduces each of its fundamental sounds in the octave higher, and thus acquires a scale of two octaves, which, partially chromatic in the old instruments, has become completely chromatic by the adoption of keys. This extension of compass is further augmented in modern instruments, in the grave sounds by keys permitting lengthenings of the primitive column of air, and in the acute by the employment of other partial sounds than the first of the harmonic series.

O'BRIEN, WILLIAM SMITH, the head of the "Young Ireland" party, was born on October 17, 1803, and received his education at Harrow and at Cambridge. He entered Parliament in 1826 as member for Ennis, and from 1835 to 1848 represented the county of Limerick. Although he spoke in 1828 in favor of Catholic emancipation, he for many years continued to differ on other points from the general policy of O'Connell. He, however, opposed the Irish Arms Act of 1843, and in January, 1844, became an active member of the Repeal Association. Though he was destitute of oratorical gifts, his chivalrous devotion to the welfare of his country secured him enthusiastic attachment as a popular leader. In July, 1846, he with the "Young Ireland" party left

the Repeal Association, and in the beginning of 1847 he established the Irish Confederation. The French Revolution of 1848 stimulated his hopes of success, and incited him to more extreme efforts against the English rule. In May, 1848, he was tried at Dublin for sedition, but the jury disagreed. In the following July he established a war directory, and attempted to make a rising among the peasantry of Ballingarry, but although he was at first joined by a large following the movement wanted cohesion, and the vacillating crowd dispersed as soon as news reached them of the approach of the dragoons. O'Brien was arrested at Thurles, tried, and sentenced to death. The sentence was commuted to transportation for life. In July, 1854, he received his liberty on condition of never revisiting the United Kingdom; and in May, 1856, he obtained a full pardon. Henceforth he kept aloof from all political movements. In 1856 he published *Principles of Government, or Meditations in Exile*. He died at Bangor, North Wales, June 18, 1864.

OBSERVATORY. Up to a comparatively recent date an "observatory" was a place exclusively devoted to the taking of astronomical observations, although frequently a rough account of the weather was kept. When the progress of terrestrial magnetism and meteorology began to make regular observations necessary the duty of taking these was often thrown on astronomical observatories, although in some cases separate institutions were created for the purpose. Of late years, as the work to be done in astronomical observatories is increasing there seems to be a general tendency to have the magnetical and meteorological observations taken in separate establishments; but, as the exclusively magnetical or meteorological observatories now existing are generally very small institutions and of recent creation, the astronomical observatories will be chiefly considered in this article.

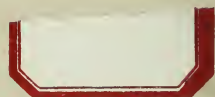
Up to about 300 B. C., it can scarcely be said that an observatory existed anywhere, as the crude observations of the heavens then taken were only made by individuals and at intervals, employing the simplest possible apparatuses. The first observatory was founded at Alexandria, and continued in activity for about 400 years, or until the middle or end of the second century of the Christian era. It was here that Hipparchus, founder of modern astronomy, discovered the precession of the equinoxes, and investigated with considerable success the motions of the sun, moon, and planets. His work was continued by more or less distinguished astronomers, until Ptolemy (in the second century A. D.) gave the astronomy of Alexandria its final development. When science again began to be cultivated after the dark ages, we find several observatories founded by Arabian princes, first one at Bagdad (and possibly one at Damascus), built by the caliph Al-Mamun early in the ninth century, then one on the Mokattam near Cairo, built for Ibn Yunis by the caliph Hakim (about 1000 A. D.), where the Hakimitic tables of the sun, moon, and planets were constructed. The Mongol khans followed the example; thus arose the splendid observatory at Meragha in the northwest of Persia, founded about 1260 A. D., by Hulagu Khan, where Nasir al-din Tusi constructed the Ilkhhanic tables; and in the fifteenth century the observatory at Samarkand was founded by Ulug Begh, and served not only in the construction of new planetary tables but also in the formation of a new catalogue of stars.

With the commencement of scientific studies in Europe in the fifteenth century the necessity of astro-

nomical observations became at once felt. The first observatory in Europe was erected at Nuremberg in 1472, by a wealthy citizen, Bernhard Walther, who for some years enjoyed the coöperation of the celebrated astronomer Regiomontanus. At this observatory, where the work was continued till the founder's death in 1504, many new methods of observing were invented, so that the revival of practical astronomy may be dated from its foundation. The two celebrated observatories of the sixteenth century, Tycho Brahe's on the Danish island of Huen (in activity from 1576 to 1597) and that of Landgrave William IV. at Cassel (1561-97), made a complete revolution in the art of observing. The impulse which Tycho Brahe gave to practical astronomy at last installed this science at the universities, among which those of Leyden and Copenhagen were the first to found observatories. The foundation of the royal observatories at Paris and Greenwich and of numerous university observatories shows how rapidly the importance of observations had become recognized by governments and public bodies, and it is not until within the last hundred years that the development of various new branches of astronomy has enabled private observers to compete with public institutions.

The instruments employed in observatories have of course changed considerably during the last 200 years. When the first royal observatories were founded, the principal instruments were the mural quadrant for measuring meridian zenith distances of stars, and the sextant for measuring distances of stars *inter se*. These instruments were introduced by Tycho Brahe, but were subsequently much improved by the addition of telescopes and micrometers. When the law of gravitation was discovered it became necessary to test the correctness of the theoretical conclusions drawn from it as to the motions within the solar system, and this necessarily added to the importance of observations. By degrees, as theory progressed, the instruments had to be improved. The transit instrument superseded the sextant; the clocks and chronometers were greatly improved; and lastly astronomers began early in the nineteenth century to treat their instruments, not as faultless apparatuses but as imperfect ones, whose errors of construction had to be detected, studied, and taken into account before the results of observations could be used to test the theory. This century has also witnessed the combination of the transit instrument and the mural quadrant or circle in one instrument—the transit or meridian circle.

OBSIDIAN, a volcanic glass, said to have been named after its discoverer, Obsidius. It is usually of black, brown, or gray color, and in some varieties banded or striated. Due not so much to the vitreous mass itself as to the presence of minute foreign bodies or microlites, which in some cases appear to be incipient crystals of feldspar, while in others they probably consist of such minerals as augite, hornblende, biotite, and magnetite. It is notable that certain kinds of obsidian possess a peculiar metallic sheen, attributed by Professor Zirkel to the presence of minute ovoid inclosures, and not to a porous structure, as had been previously suspected. There can be no doubt that obsidian has been formed by the rapid cooling of a felspathic lava. It is found chiefly in Iceland, the Lipari Islands, Melos, and other isles of the Greek archipelago, the Caucasus, Siberia, Mexico, Peru, and New Zealand.





Made in Italy

05-14 STD

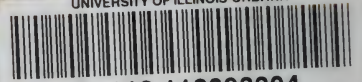


8 032919 991409

www.colibrisystem.com



UNIVERSITY OF ILLINOIS-URBANA



3 0112 112093304